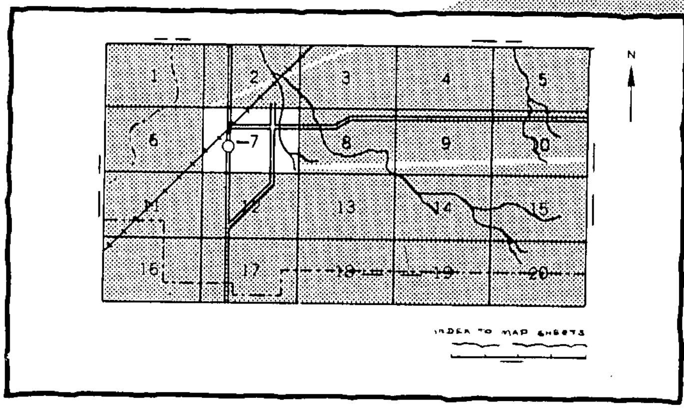
Soil Survey of

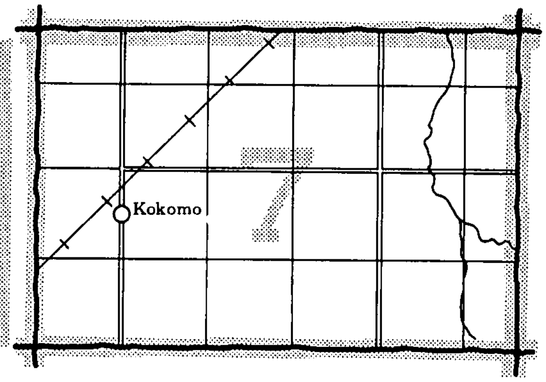
Colfax County, Nebraska

United States Department of Agriculture
Soil Conservation Service
in cooperation with
University of Nebraska, Conservation and Survey Division

HOW TO USE

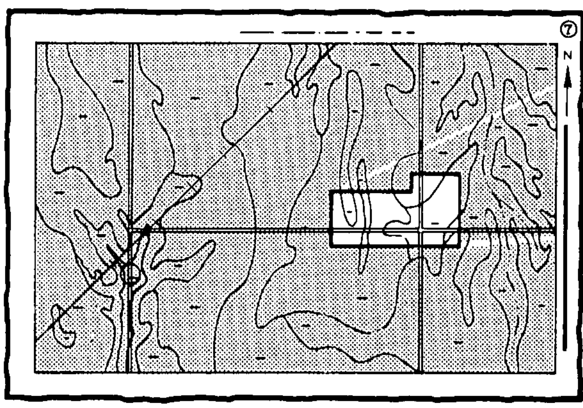
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

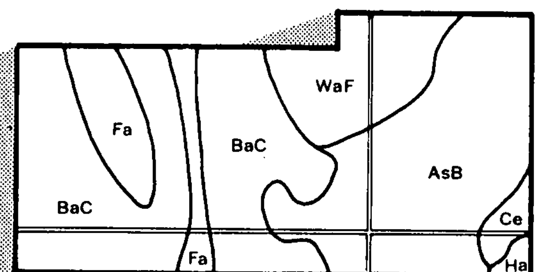




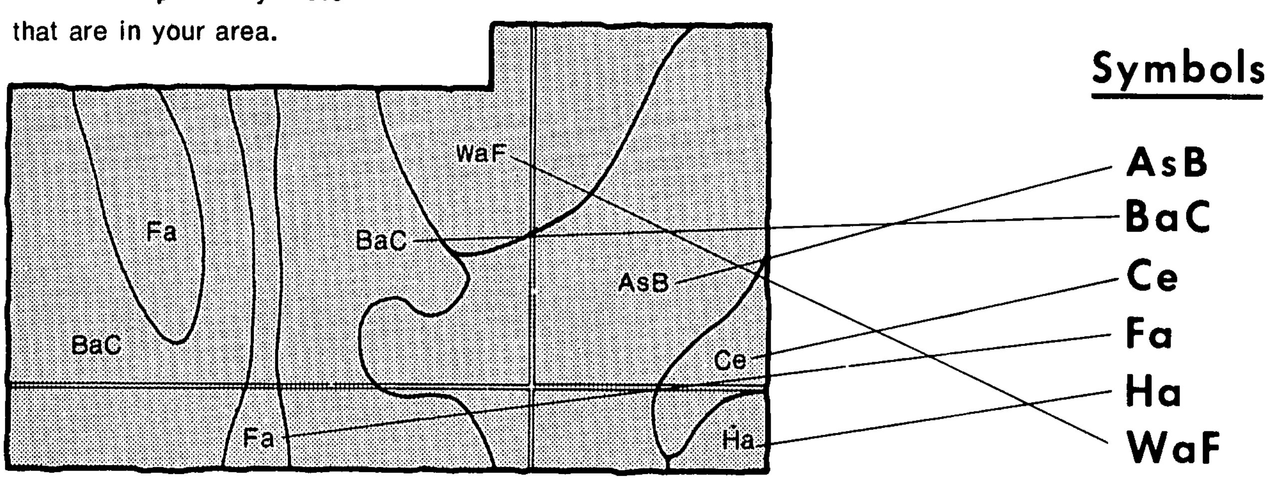
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



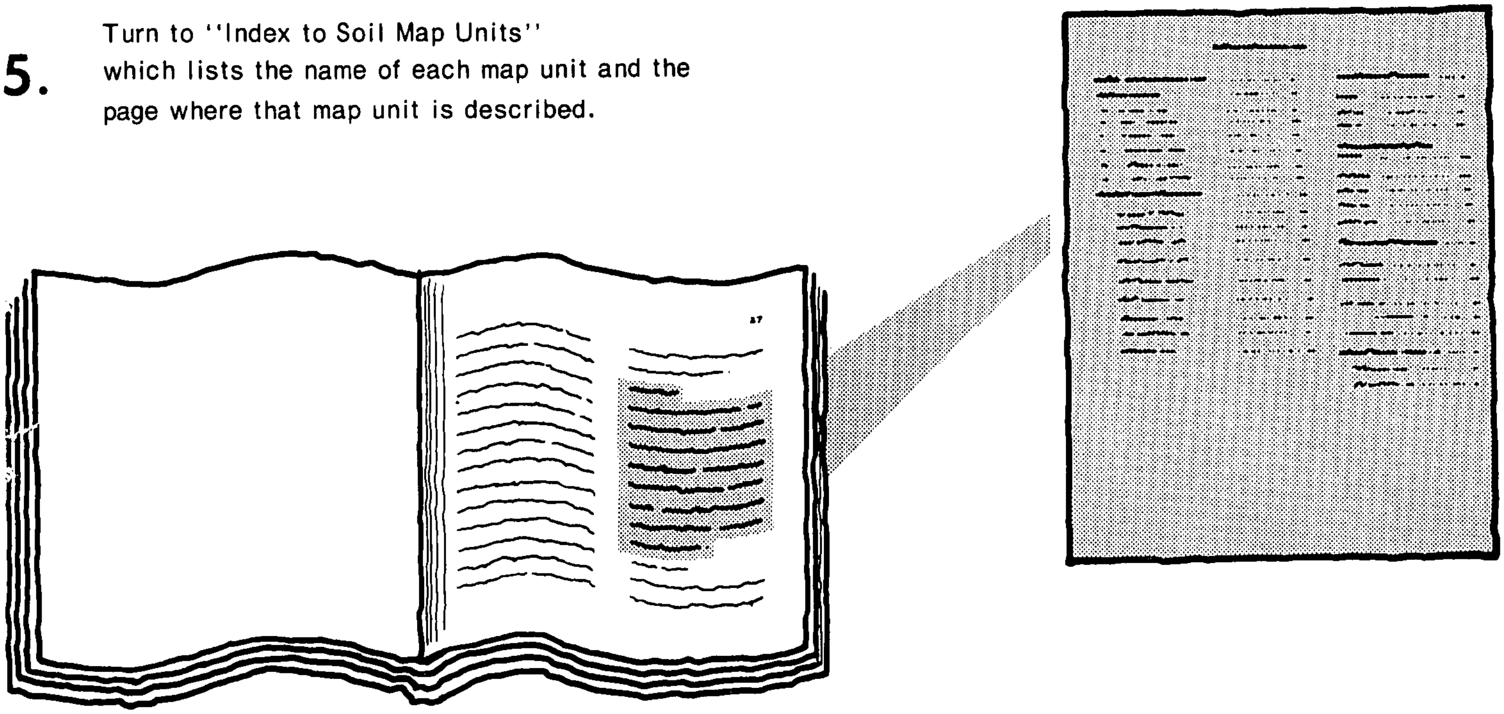


4. List the map unit symbols that are in your area.

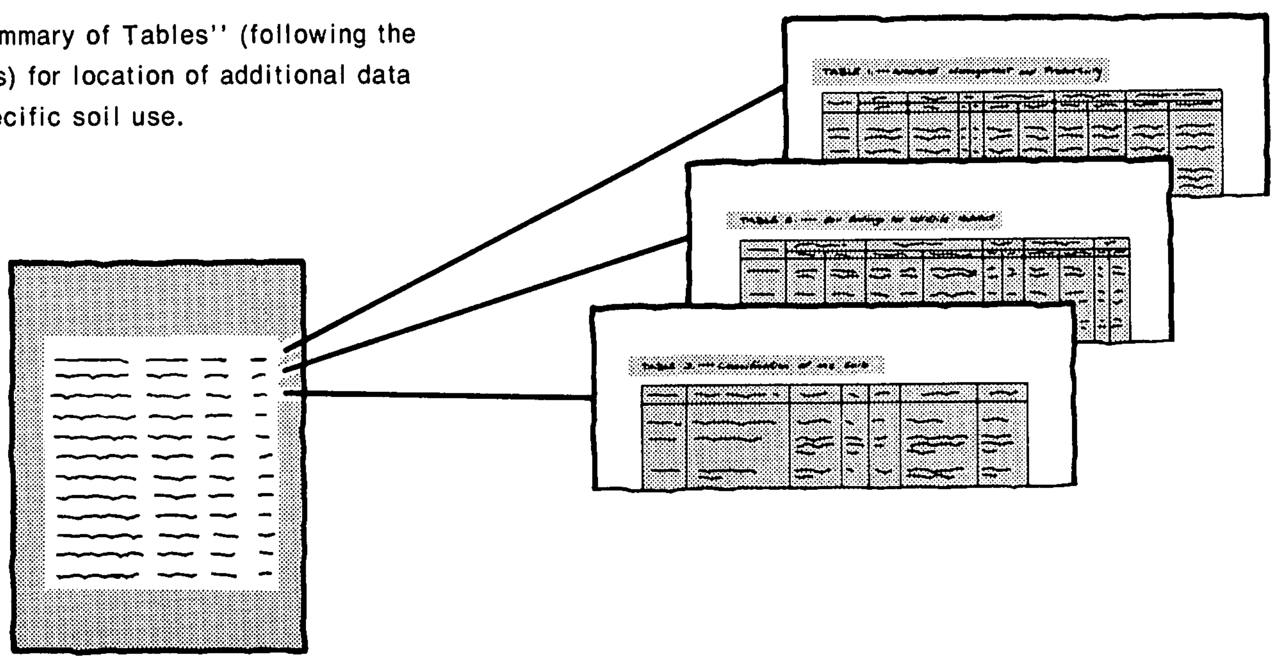


THIS SOIL SURVEY

5\. Turn to ''Index to Soil Map Units'' which lists the name of each map unit and the page where that map unit is described.



6\. See ''Summary of Tables'' (following the Contents) for location of additional data on a specific soil use.



7\. Consult ''Contents'' for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service and the University of Nebraska, Conservation and Survey Division. It is part of the technical assistance furnished to the Lower Elkhorn and the Lower Platte North Natural Resource Districts. Major fieldwork was performed in the period 1975-78. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. The lower Elkhorn and the Lower Platte North Natural Resources Districts and the Colfax County Board of Commissioners provided financial assistance.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Contour farming, grassed waterways, and a farmstead windbreak help protect the soils from erosion on this typical landscape of the Nora-Crofton-Moody association.

Contents

Soil series

Issued January 1982

Index to soil map units

Summary of tables

Foreword

This soil survey contains information that can be used in land-planning programs in Colfax County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Albert E. Sullivan
State Conservationist
Soil Conservation Service

Soil survey of
Colfax County, Nebraska

By Paul A. Bartlett, Soil Conservation Service, and
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United States Department of Agriculture, Soil Conservation Service
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COLFAX COUNTY is in the east-central part of Nebraska (fig. 1). It is bordered on the south by Butler County, on the west by Platte County, on the north by Stanton and Cuming Counties, and on the east by Dodge County. Colfax County covers an area of 405 square miles and has a land area of 259,840 acres. Schuyler, the county seat, is the largest town in the county.

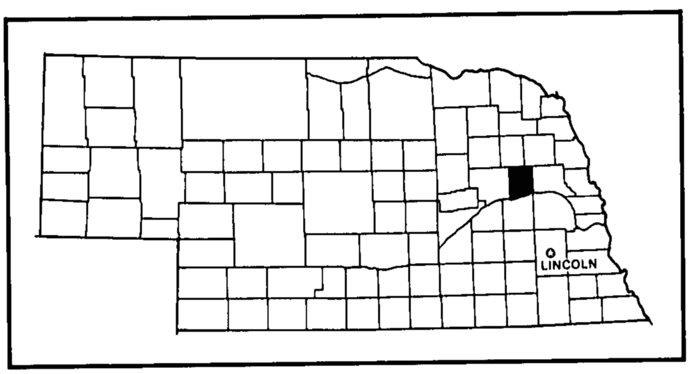

Figure 1.—Location of Colfax County in Nebraska.

Agriculture is the foundation of Colfax County's economy. Nearly all the land is used for farming. Corn is the principal crop. Soybeans, alfalfa, and small grain are other important crops.

Under dryland farming about 7.0 percent of the acreage is class I soils, 39.5 percent is class II soils, 37.0 percent is class III soils, 11.8 percent is class IV soils, 4.4 percent is class VI soils, and 0.2 percent is class VIII soils according to the land capability classification system used for this survey. There are no class V or class VII soils in Colfax County. About 0.1 percent of the county's acreage is in small water areas, primarily farm ponds, reservoirs, and lakes.

Most soils in Colfax County are silty, loamy, or clayey. They range from deep to shallow over mixed sand and gravel, from somewhat excessively drained to very poorly drained, and from nearly level to very steep. About 76.3 percent of the soils in Colfax County are well drained, 5.2 percent are somewhat excessively drained, 1.3 percent are moderately well drained, 4.6 percent are somewhat poorly drained, and about 12.3 percent are poorly or very poorly drained.

Soils of the uplands formed mainly in loess and are silty. Some of the soils on uplands formed in glacial till and in eolian sands, but areas of these soils are not extensive. The soils along the streams and drainageways formed in alluvium. The uplands are dissected by two stream systems—Maple Creek and Shell Creek. The soils in the valleys of these streams are silty or clayey.

Colfax County is bounded on the south by the Platte River, and the southern two-fifths of the county is in the Platte River Valley. The major soils in the Platte Valley developed in silty or clayey alluvium. Soils that formed in sandy alluvium range from deep to shallow over sand and gravelly sand. The principal limitation of these soils for most uses is wetness from the seasonal high water table. Flooding, which is rare to frequent, is the principal hazard. Maintaining fertility and conserving water are important management concerns.

Colfax County has eleven school districts. High schools and elementary schools are in the towns of Clarkson, Howells, Leigh, and Schuyler.

Transportation facilities in the county include railroads, highways, and airports. The double main line of the Union Pacific Railroad follows the Platte River Valley and serves Rogers, Schuyler, and Richland. Bus service is available at Schuyler, and air service is available in the nearby cities of Columbus, Fremont, and Omaha.

The county is crossed by all-weather highways. U.S. Highway 30 runs east to west through the southern part of the county. Nebraska Highway 15 runs north to south through the center of the county, and Nebraska Highway 91 crosses the northern part of the county.

The rural road system is well developed. Roads generally have been built along section lines. Most roads are gravelled, and a few have an asphalt surface.

This survey supersedes the soil survey of Colfax County published in 1930(*3*). It updates the earlier survey and provides additional information, and it includes larger maps that show the soils in greater detail.

General nature of the survey area

This section provides general information about Colfax County. It discusses history and population; climate; physiography, relief, and drainage; geology; ground water supply; manufacturing and agricultural business; and trends in farming.

History and population

The first permanent settlement in Colfax County was made in 1856 near the mouth of Shell Creek. The county was formed from the eastern part of Platte County in 1869.

The first inhabitants of the county were Indians, trappers, hunters, and cattlemen. The range was free, and the cattle industry prospered on the lush prairie grasses. The cattlemen were forced west as more of the land was farmed.

The earliest permanent settlers came to Colfax County from Omaha and from the eastern and east-central states. A large percentage of the early settlers were of German and Bohemian descent. In the northern part of the county, most of the settlers were Bohemian. In the southeastern part of the county, most of the settlers were Scottish or Irish.

In 1970, Colfax County had a population of 9,498. Schuyler, the largest town, had a population of 3,597. Most of the residents earn their living by farming or have jobs associated with agriculture.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Colfax County is cold in winter and quite hot with occasional cool spells in summer. Precipitation during the winter frequently occurs as snowstorms. Precipitation during the warm months is chiefly showers, often heavy, that occur when warm moist air moves in from the south. The total annual rainfall is normally adequate for corn, soybeans, and small grain.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Clarkson, Nebraska, for the period 1951 to 1977. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 24 degrees F, and the average daily minimum temperature is 13 degrees. The lowest temperature on record, which occurred at Clarkson on January 12, 1974, is -31 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred on August 11, 1954, is 111 degrees.

Growing degree days, shown in table 1, are equivalent to heat units. During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F.). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 21 inches, or 75 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 17 inches. The heaviest 1-day rainfall during the period of record was 3.65 inches at Clarkson on July 14, 1966. Thunderstorms occur on about 50 days each year and most occur in summer.

Average seasonal snowfall is 25 inches. The greatest snow depth at any one time during the period of record was 27 inches. On the average, at least 1 inch of snow is on the ground 13 days of the year, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night and averages about 80 percent at dawn. The sun shines 75 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the north-northwest from November through April and from the south-southeast from May through October. Average windspeed is highest, 12 miles per hour, in spring.

Tornadoes and severe thunderstorms strike occasionally. These storms are local and of short duration and result in sparse damage in narrow belts. Hailstorms occur at times during the warmer part of the year in irregular patterns and in relatively small areas.

Physiography, relief, and drainage

Colfax County is in the Great Plains physiographic province. The strongest relief is in the breaks adjacent to the Shell Creek and Platte River Valleys. Relief between ridgetops and bottoms of the adjacent drainageways ranges to a maximum of about 100 feet.

About 60 percent of Colfax County is an upland landscape. This landscape consists of ridgetops, side slopes, and narrow valleys. The ridgetops are rounded and commonly are gently sloping. The side slopes range from gently sloping to steep.

The Platte River Valley is nearly level except for a few hummocky areas of sandy soils. Small drainageways transect the valley. A stream terrace borders the valley on the north side. This terrace is about 1 mile wide at the western end of the county, just north of Richland, and tapers to a point about 2 miles north of Schuyler. Stream terraces constitute about 5 percent of the county, and bottom lands about 35 percent of the county.

Colfax County is drained by the Platte River and its tributaries, by Shell Creek and Lost Creek, and by Maple Creek and Rawhide Creek, which are tributaries of the Elkhorn River. The Platte River flows to the east and northeast. Shell Creek and Lost Creek flow into the Platte River from the west and northwest. The Maple Creek system flows to the southeast, and Rawhide Creek flows to the east. The Platte River and its major tributaries flow continuously except during periods of extended drought.

The lowest elevation in the county, in the extreme southeastern part of the county, is about 1,300 feet above sea level. The highest elevation, which is in the northwestern part of the county, is about 1,720 feet. Schuyler is at an elevation of about 1,350 feet.

Geology

Loess, till, and alluvium are at or near the land surface in Colfax County. The bedrock is of Cretaceous age and lies 60 to 400 feet below the land surface. There are no known outcrops of bedrock in Colfax County.

Deposits of sand and gravel or of glacial till overlie the bedrock. The sand and gravel deposits are excellent sources of water for irrigation, industry, and domestic uses. The glacial till consists mostly of clay with scattered lenses of sand and pockets of gravelly sand. It generally yields only small amounts of water to wells. Till is present beneath most of the uplands, but is absent or very thin beneath the Platte River Valley. Areas where till crops out are indicated on the soil maps by Steinauer soils or by a till outcrop symbol.

Overlying the till is brown and light brown loess of the Loveland Formation. This loess crops out on upland slopes in many places, but the outcrop is seldom more than a narrow band on the slope. The soils of the Geary Variant formed in this loess. The outcrops of Loveland loess are indicated on the soil maps by a special symbol.

A thick layer of buff-colored loess mantles the Loveland loess and is at the surface on nearly all of the uplands and stream terraces. This loess is a slightly clayey, calcareous silt that is moderately permeable to air and water. It is the parent material of Belfore, Crofton, Fillmore, Moody, and Nora soils.

Areas of eolian sand occur in scattered areas on slopes adjacent to the major streams. There is an area of eolian and fluvial sand between Shell Creek and the Platte River. Thurman soils formed in eolian sand. Outcrops of sand are indicated on the soil maps by a special symbol.

Alluvium in the smaller valleys consists of silt and clay. The alluvium directly adjacent to the Platte River is sand and grades to silt and clay as the distance from the river increases. Major soils that developed in sand are Alda, Boel, Inavale, Ord, and Platte soils. Colo, Hobbs, Lawet, and Shell soils formed in silty alluvium. Luton soils formed in clayey alluvium. Hall soils formed in silty loess underlain by coarse sand on the stream terrace that is at the north edge of the Platte Valley, extending from near Highway 15 north of Schuyler to the Platte County line north of Richland. Blendon soils formed in loamy alluvium on the terrace just north of the Platte River. The town of Schuyler is on this terrace.

The land surface in Colfax County was relatively stable before agricultural disturbance; there was little movement of surface materials by water and very little movement or shifting by wind. Cultivated crops have replaced the native grasses, and the soil surface is no longer well protected from erosion. The nearly level and gently sloping silty areas remain relatively stable. Areas with rolling and steep slopes have a great deal of movement of surface material and produce high amounts of sediment. In sandy areas, surface materials are now subject to considerable shifting by wind and to some movement by water, but very little material is moved out of the area.

The small valleys in the uplands have always received runoff water from the adjacent slopes. Some of the surface material washed from the slopes is added to the valley alluvium. Under native prairie vegetation, the slight movement of surface materials resulted in dark colored alluvium being laid down in thin increments with minimal evidence of stratification. As cultivated crops replaced the native vegetation, the alluvium added by each overflow became thicker, lighter in color, and more definitely stratified. In most small valleys, 2 to 5 feet of alluvium overlies the dark colored preagricultural land surface. Flooding is occasional in most of these areas.

The broad valley of the Platte River receives slight additions of overflow material by runoff from adjacent uplands. Areas adjacent to river channels are frequently or occasionally flooded. Both scour and deposition occur during overflows. The scour is largely shifting of material rather than removal. Upland streams that cross the valley carry much sediment at flood stage and add clayey fine and silty coarse material to overflowed areas.

Ground water supply

Wells throughout Colfax County provide water for domestic and livestock use, for industrial use, and for irrigating crops.

On the uplands, water suitable for domestic and livestock use comes from deposits of sand and gravel in the glacial till or beneath the till or from the limestone or sandstone bedrock. Deposits of sand and gravel lie beneath the valleys of the Platte River, Shell Creek, and Maple Creek. These deposits yield water of good quality and in sufficient quantity for industrial and domestic needs. In most of these valley areas and locally in the uplands, irrigation wells can be developed. There were 649 registered irrigation wells in Colfax County as of December 31, 1978.

The water from the sand and gravel beneath the valleys and the water from the sand or gravel lenses in till is also rated "hard" or "very hard." This water commonly has sulphates and iron in amounts that are objectionable but are not a health hazard to people or livestock. Water from the bedrock may have objectionable quantities of iron, sodium chloride, or sulphates. Ground water can be contaminated by drainage from feedlots or septic tanks or from other sources of waste. If a domestic well is installed, samples of the water should be tested for contamination.

Manufacturing and agricultural business

Several firms that manufacture products for national markets are in the Schuyler area. The products are mostly agricultural, such as meat, alfalfa meal, and grain products. Several businesses sell and service machinery used in agriculture.

Fattened cattle and hogs are shipped to Omaha or are purchased by local meatpackers. Dairy and poultry products produced on the farm are marketed inside and outside the county. Grain and feed products not used on the farm are sold at local elevators and shipped to other markets.

Trends in farming

Agriculture has been the foundation of the economy in Colfax County since it was settled. Cattlemen used the native prairie for grazing land until the homesteaders began to settle in the late 1880's. By 1920, most of the county was being farmed. The 1969 Nebraska Agricultural Statistics listed 1,020 farms in Colfax County. By 1977, the number had dropped to 960. This reduction is primarily due to increase in the size of remaining farms. Urbanization has been a minor factor in the reduction of the number of farms.

Farm production has grown with the increase in use of commercial fertilizer and irrigation. In 1965, 7,871 tons of commercial fertilizer was sold; in 1977, the figure was 19,416 tons. The number of irrigated acres increased from 20,300 in 1965 to 47,000 in 1977.

Corn is the main cultivated crop in the county. The acreage of dryland corn increased from 50,160 acres in 1965 to 84,100 acres in 1977. The acreage of irrigated corn increased from 11,460 acres in 1965 to 27,800 acres in 1977. Soybeans have also increased in importance as a cash crop. In 1965, 20,000 acres was used for soybeans. By 1977, the acreage had increased to 45,000 acres.

The acreage of oats, wheat, and sorghum is in a general decline. The acreage of alfalfa and introduced grass remains about the same. Some areas of native grass rangeland are being converted to cropland and are irrigated by center-pivot systems.

The livestock industry has shown minor shifts in the kind of livestock produced in recent years. The total number of cattle raised increased from 62,500 head in 1965 to 67,400 head in 1977. Dairy cattle, however, decreased in numbers from 3,300 head in 1965 to 1,500 head in 1977. The number of hogs on county farms was 59,180 in 1965 and 62,800 in 1977. Colfax County is a major producer of poultry in Nebraska. In 1965, the number of chickens on farms was 296,230, and in 1977 the number was 306,500. The number of sheep on farms has decreased in recent years.

Vegetable gardens supplement home food supplies. A small part of this produce is sold locally.

How this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists.

For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

General soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit, or soil association, on the general soil map is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other associations but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one soil association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil descriptions

Silty soils on uplands and foot slopes

Two associations are in this group. The soils are gently sloping to steep and are well drained and somewhat excessively drained. Most of the acreage, except for small areas of introduced or native grasses near farmsteads and on steep slopes, is cultivated under dryland management. Some areas, where high-yielding wells are available, are irrigated, mainly by a center-pivot system. Erosion by water is the main hazard. Maintaining a high level of fertility, controlling runoff, and conserving moisture for plants are the main concerns of management.

1. Nora-Crofton-Moody association

Deep, gently sloping to steep, well drained and somewhat excessively drained silty soils that formed in loess; on uplands

This association is on dissected uplands that have a thick mantle of loess. The ridgetops are long, narrow, and gently sloping. The side slopes are strongly sloping and steep. This association is dissected by numerous narrow intermittent drainageways (fig. 2). Narrow foot slopes are at the base of many of the upland areas.

This association makes up about 46 percent of the county. It is about 32 percent Nora soils, 23 percent Crofton soils, 23 percent Moody soils, and 22 percent soils of minor extent.

The Nora soils are gently sloping to moderately steep and occur on ridgetops and side slopes. They are deep, well drained soils. Typically, the surface layer is dark grayish brown, friable silty clay loam about 9 inches thick. The subsoil is friable silty clay loam about 18 inches thick. The upper part is brown, and the lower part is pale brown. The underlying material to a depth of 60 inches is very pale brown, mottled, calcareous silt loam.

The Crofton soils are deep, well drained and somewhat excessively drained, calcareous soils on ridgetops and side slopes. They are gently sloping to steep. Typically, the surface layer is brown, friable, calcareous silt loam about 9 inches thick. The underlying material to a depth of 60 inches is calcareous silt loam. It is light gray in the upper part and light brownish gray in the lower part.

The Moody soils are on ridgetops and side slopes. They are deep, well drained, and gently sloping or strongly sloping. Typically, the surface layer is dark grayish brown, friable silty clay loam about 7 inches thick. The subsoil is friable silty clay loam about 29 inches thick. The upper part is dark grayish brown and brown, and the lower part is yellowish brown. The underlying material to a depth of 60 inches is pale brown silty clay loam in the upper part and pale brown silt loam in the lower part.

Of minor extent in this association are Alcester, Hobbs, Kezan, and Geary Variant soils. The well drained Alcester soils are on foot slopes. The Geary Variant soils are on side slopes. The well drained, stratified Hobbs soils are in narrow upland drainageways that are occasionally flooded. The Kezan soils are poorly drained and in narrow upland drainageways.

The farms on this association are diversified, mainly a combination of cash grain and livestock enterprises. Corn, soybeans, oats, and alfalfa, which are grown under dryland farming, are the main crops. A few sprinkler irrigation systems are used where high-yielding wells are available. Introduced and native grasses are grown near farmsteads and in small areas where slopes are steepest.

Soil erosion is the main hazard on this association. Maintaining soil fertility, controlling runoff, and conserving moisture are the main concerns of management. Wetness limits the use of some of the minor soils in drainageways for cultivated crops. Organic matter content needs to be improved in many areas.

The farms on this association average about 200

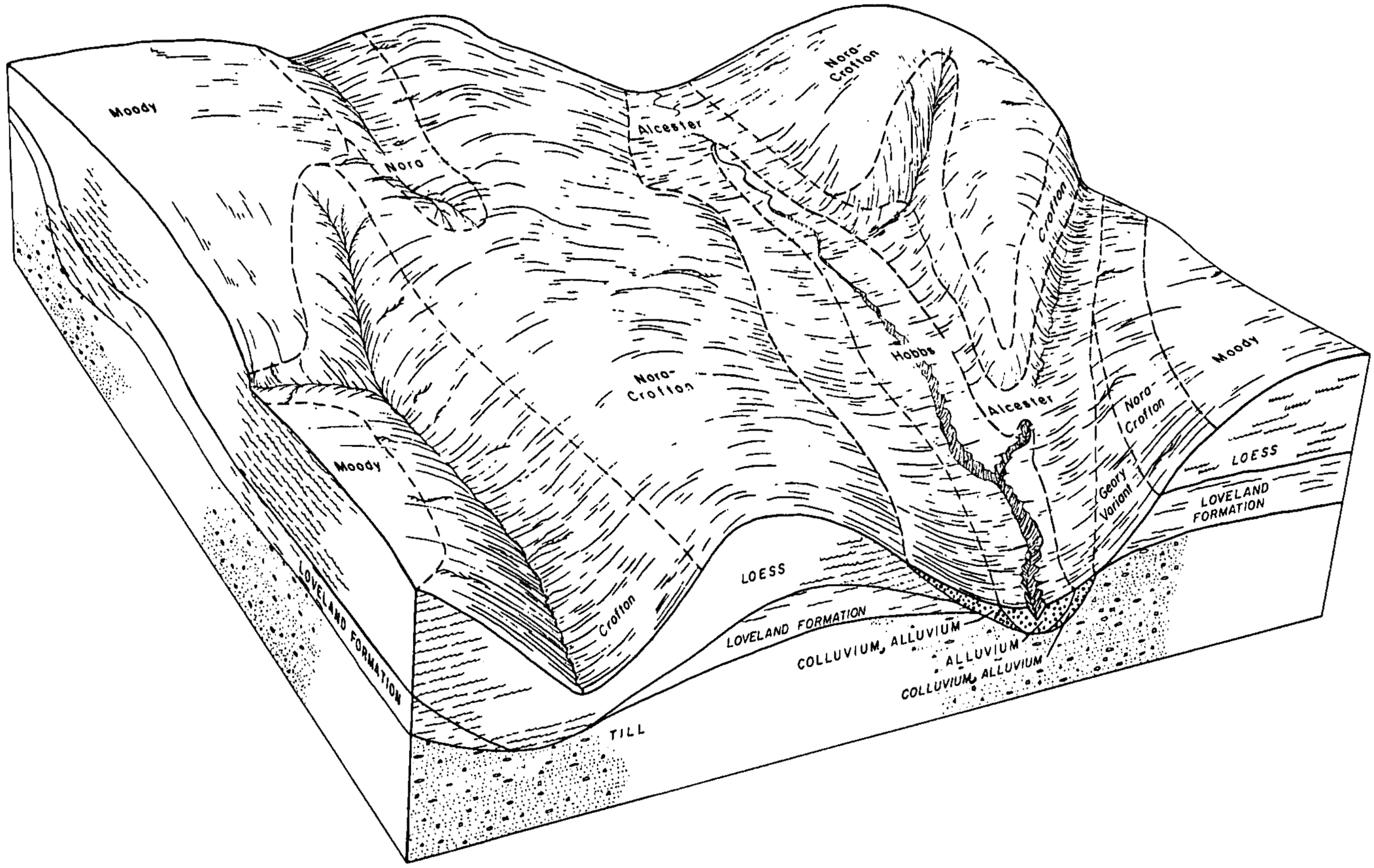

Figure 2.—Typical pattern of soils and parent material in the Nora-Crofton-Moody association.

acres. Most cash crops and livestock are marketed locally. Some livestock are shipped to terminals outside the county.

2. Moody-Alcester association

Deep, gently sloping and strongly sloping, well drained silty soils that formed in loess and in a mixture of colluvium and alluvium; on uplands and foot slopes

This association consists of broad, smooth areas of gently sloping and strongly sloping soils on loess uplands and the adjacent areas of gently sloping soils on foot slopes (fig. 3). There are many drainageways and only a few of the larger streams.

This association makes up about 10 percent of the county. Moody soils make up about 67 percent of this association and Alcester soils about 19 percent. Soils of minor extent make up the rest.

The Moody soils are gently sloping and strongly sloping and are in the broad, smooth areas of the uplands. They are deep, well drained soils. Typically, the surface layer is dark grayish brown, friable silty clay loam 7 inches thick. The subsoil is friable silty clay loam about 29 inches thick. The upper part is dark grayish brown and brown, and the lower part is yellowish brown. The underlying material to a depth of 60 inches is pale brown silty clay loam in the upper part and pale brown silt loam in the lower part.

The Alcester soils are deep, well drained, gently sloping soils on foot slopes. Typically, the surface layer is dark grayish brown, friable silt loam about 24 inches thick. The subsoil is friable silty clay loam about 12 inches thick. The upper part is grayish brown, and the lower part is brown. The underlying material to a depth of 60 inches is light yellowish brown silt loam.

Of minor extent in this association are Nora, Crofton, and Belfore soils. The silty Nora and Crofton soils are on the steeper side slopes of uplands. Belfore soils are more clayey in the subsoil than the major soils and are on uplands.

The farms in this mapped area are diversified. They are primarily a combination of cash grain and livestock

operations. Corn, soybeans, and alfalfa are the principal crops and are grown primarily under dryland farming. Wheat, oats, and grain sorghum are also grown. In a few of the less sloping areas the gravity method of irrigation is used, and in a few of the more sloping areas the center-pivot type of sprinkler system is used. The potential for irrigation is high where high-yielding, good quality wells can be drilled. There are a few small areas of pasture.

Soil erosion is the main hazard on these gently sloping and strongly sloping soils. Maintaining a high level of fertility and controlling runoff are the main concerns of management.

The farms on this association average about 320 acres. Most of the produce is marketed in the county. Some of the livestock—cattle and hogs—are shipped to terminal markets outside the county.

Silty soils on uplands and stream terraces and in upland depressions

Two associations are in this group. The soils are nearly level and gently sloping and are well drained or poorly drained. Most of the acreage is in dryland cultivated crops. Introduced or native grasses grow in a few depressions and in small areas of sandy soils. Part of the acreage is irrigated by sprinkler systems. Some of the nearly level areas are irrigated by gravity systems. Erosion by water on gently sloping and strongly sloping areas and ponding in the depressions are the main hazards. Conserving moisture for use by plants and maintaining fertility are the main concerns of management.

3. Moody-Fillmore association

Deep, nearly level and gently sloping, well drained and poorly drained silty soils that formed in loess; on uplands and stream terraces and in upland depressions

This association consists of areas of gently sloping soils on ridges and side slopes of the loess uplands (fig. 4) and on high stream terraces and interspersed areas of nearly level soils in depressions. The depressions are south of Shell Creek and north of the town of Richland.

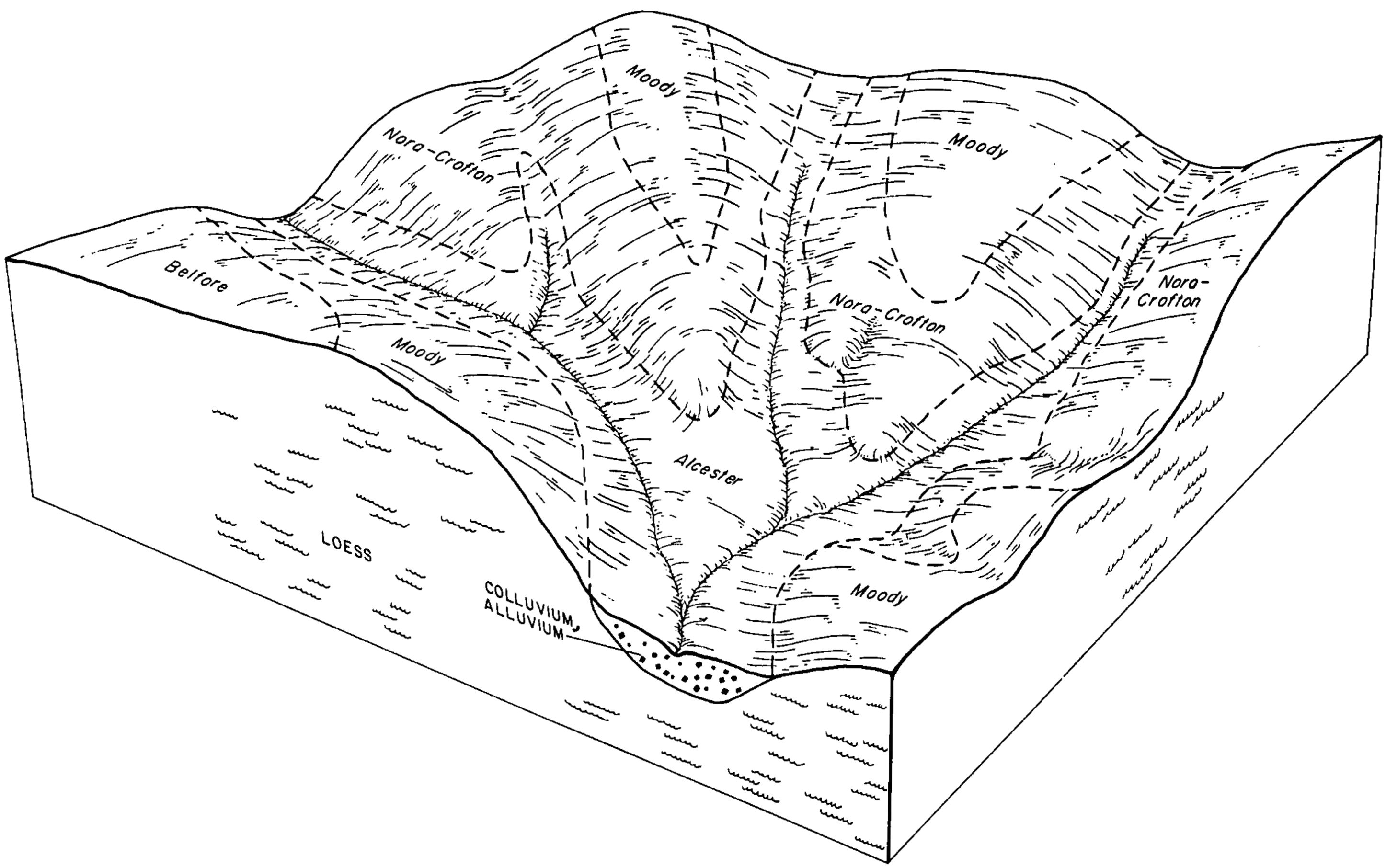

Figure 3.—Typical pattern of soils and parent material in the Moody-Alcester association.

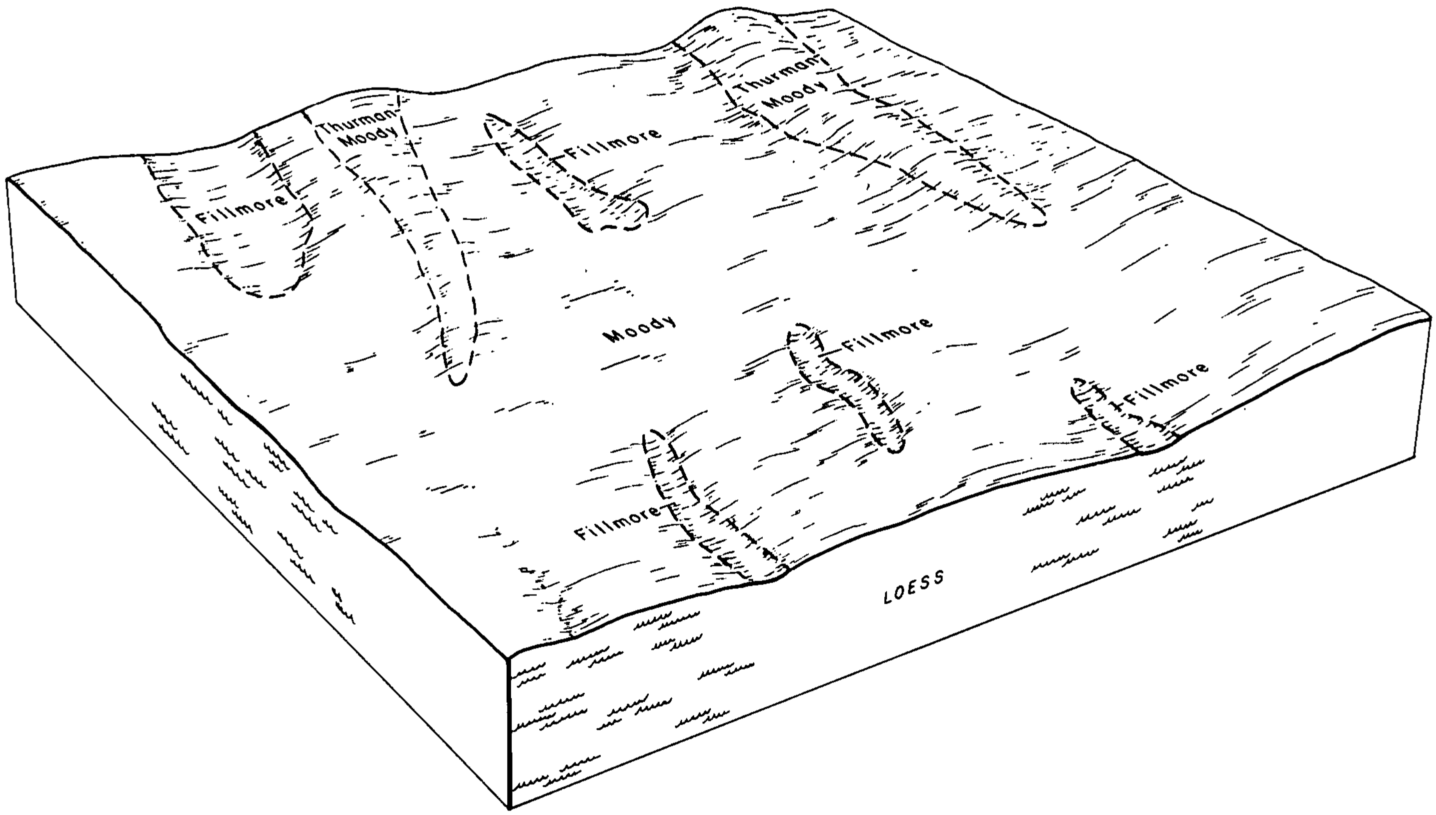

Figure 4.—Typical pattern of soils and parent material in the Moody-Fillmore association.

This association makes up about 9 percent of the county. It is about 66 percent Moody soils, 9 percent Fillmore soils, and 25 percent soils of minor extent.

The Moody soils are gently sloping and are on ridgetops and side slopes of the uplands, in places on the side slopes of depressions, and on high stream terraces. They are deep, well drained soils. Typically, the surface layer is dark grayish brown, friable silty clay loam about 7 inches thick. The subsoil is friable silty clay loam about 29 inches thick. The upper part is dark grayish brown and brown, and the lower part is yellowish brown. The underlying material to a depth of 60 inches is pale brown silty clay loam in the upper part and pale brown silt loam in the lower part.

The Fillmore soils are nearly level and are in the depressions. They are deep, poorly drained soils. Typically, the surface layer is friable silt loam about 11 inches thick. The upper part is dark grayish brown, and the lower part is gray. The subsurface layer is a leached horizon of light gray silt loam about 8 inches thick. The subsoil is dark gray silty clay about 33 inches thick. It is very firm in the upper part and firm in the lower part. The underlying material to a depth of 60 inches is grayish brown silty clay loam.

Of minor extent in this association are the nearly level Belfore soils on stream terraces, the gently sloping to strongly sloping Thurman soils on side slopes and a few ridgetops, and the gently sloping to strongly sloping Nora soils on side slopes and ridgetops.

The farms on this association consist of a combination of cash grain and livestock operations. Most of the acreage is in cultivated crops farmed under dryland conditions. The principal crops are corn, soybeans, grain sorghum, and alfalfa. There is also a small acreage of winter wheat and oats. A few sandy areas and wet depressions are in introduced grasses for pasture and in native grasses for range. Irrigation is also important. On most of the irrigated farmland the sprinkler method is used, whereas in some of the nearly level areas the gravity method is used. The potential for irrigation is high in this association.

The hazard of erosion by water on the gently and strongly sloping areas and the hazard of ponding in the depressions are the main hazards. Preventing runoff and maintaining fertility are the main concerns in management. Soil blowing and droughtiness are hazards on the sandy soils of minor extent.

The soybeans and winter wheat are grown for cash. Corn and sorghum are cut for silage. Some cattle are fattened in the feedlot and are marketed at a local packing plant. Other cattle and hogs are shipped to terminal markets in larger cities outside the county. A few cow-calf herds are kept. Most of the calves are sold locally. Markets for most farm products are readily accessible.

4. Belfore association

Deep, nearly level, well drained silty soils that formed in loess; on uplands

This association consists mainly of nearly level soils on broad divides on the loess uplands. Some of the soils are in narrow swales and small, shallow depressions. This association takes in some of the highest elevations in the county.

This association makes up about 2 percent of the county. It is about 80 percent Belfore soils and 20 percent soils of minor extent.

The Belfore soils are nearly level and on the broad divides. Typically, the surface layer is very dark grayish brown and dark gray, firm silty clay loam about 16 inches thick. The subsoil is firm, silty clay loam about 27 inches thick. It is brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is very pale brown silty clay loam.

The soils of minor extent are the poorly drained Fillmore soils in upland depressions and the gently sloping Moody soils on narrow ridgetops and side slopes of the loess uplands.

Most of the acreage of this association is in dryland cultivated crops. The principal crops are corn, soybeans, alfalfa, and, in small areas, oats, winter wheat, and grain sorghum. A few depressional areas are in introduced or native grasses, which are usually grazed by cattle. Irrigation is also important. Gravity and sprinkler systems are used. Corn, soybeans, and alfalfa are the principal irrigated crops. The potential for irrigation in this association is high.

Erosion on the gently sloping Moody soils and ponding in the depressional areas of Fillmore soils are the main hazards on this association. Maintaining fertility is the main concern of management. Drainage of the depressional areas is a concern of management, but suitable outlets are not common. In places, large pits are dug to hold the excess water.

The farms on this association average about 240 to 320 acres and are diversified. They consist mainly of a combination of cash grain and livestock operations. Soybeans and winter wheat are grown for cash. Much of the grain and hay is fed to cattle and hogs being fattened for market. Fattened cattle and hogs are commonly marketed locally through sale barns or direct to livestock buyers. A small percentage of the livestock is shipped to terminal markets in large cities outside the county. A few cow-calf herds and dairy herds are kept. Most calves are sold locally, while the milk produced is shipped by truck to areas outside the county. Markets for farm products are readily accessible.

Silty, loamy, and sandy soils on upland slopes adjacent to valleys

Two associations are in this group. The soils are gently sloping to steep and are well drained or somewhat excessively drained. A small part of the acreage is cultivated. The areas of steep soils and some of the areas of sandy soils are in introduced or native grasses that are either grazed or cut for hay. The sandy soils that are cultivated are generally irrigated by a sprinkler system. Water erosion on the steeper soils and water erosion and soil blowing on the sandy areas are the main hazards. Conserving moisture for use by plants and improving fertility are the main concerns of management.

5. Steinauer-Moody association

Deep, strongly sloping to steep, well drained loamy and silty soils that formed in glacial till and loess; on uplands

This association consists of strongly sloping and steep soils on uplands adjacent to the valleys of Shell Creek and Taylor Creek.

This association makes up about 2 percent of the county. It is about 37 percent Steinauer soils, 15 percent Moody soils, and 48 percent soils of minor extent.

The Steinauer soils are strongly sloping to steep and are on side slopes of uplands. They are deep and well drained and formed in glacial till. Stones commonly are scattered on the surface. Typically, the surface layer is dark grayish brown, friable, calcareous clay loam about 5 inches thick. The underlying material to a depth of 60 inches is light gray and very pale brown, mottled, calcareous clay loam.

The strongly sloping Moody soils are on ridgetops and side slopes of the uplands. They are deep and well drained and formed in loess. Typically, the surface layer is dark grayish brown, friable silty clay loam about 7 inches thick. The subsoil is friable silty clay loam about 29 inches thick. The upper part is dark grayish brown and brown, and the lower part is yellowish brown. The underlying material to a depth of 60 inches is pale brown silty clay loam in the upper part and pale brown silt loam in the lower part.

Of minor extent in this association are Geary Variant, Alcester, Crofton, and Nora soils. The light brown Geary Variant soils formed in Loveland loess and are on side slopes of uplands. The silty Alcester soils are on foot slopes. The calcareous Crofton soils are on side slopes of loess uplands. The silty Nora soils are on ridgetops and side slopes of loess uplands.

Farms on this association are diversified and consist mainly of a combination of cash grain and livestock

operations. Some cow-calf herds are kept, and cattle and hogs are fattened on many farms. The areas of steep soils are mainly in native or introduced grasses that are either grazed or cut for hay. Some areas are in scattered trees, such as bur oak and other hardwoods. Dryland corn, sorghum, and oats are the principal crops. Generally, soils of this association are not irrigated.

Erosion by water is the main hazard on this association. Controlling runoff and improving the level of soil fertility are the main concerns of management.

The farms on this association average about 200 acres. The produce is marketed mainly within the county.

Camp Luther provides outdoor recreation. The wooded acreage in this association provides excellent habitat for deer, quail, and other wildlife.

6. Moody-Thurman association

Deep, gently sloping to strongly sloping, well drained and somewhat excessively drained silty and sandy soils that formed in loess and eolian sands; on uplands

This association consists of soils on upland slopes bordering the Platte River Valley. The soils are gently sloping and strongly sloping and constitute side slopes and, in places, narrow ridgetops.

This association makes up about 1 percent of the county. It is about 37 percent Moody soils, 25 percent Thurman soils, and 38 percent soils of minor extent.

The Moody soils are deep and well drained and are on the side slopes and ridgetops. They are gently sloping and strongly sloping. The typical Moody soil in this association is not typical of the Moody soils in Colfax County. It has a surface layer of dark grayish brown, friable silty clay loam about 6 inches thick. The subsoil is friable silty clay loam about 14 inches thick. The upper part is grayish brown, and the lower part is pale brown. The underlying material to a depth of 60 inches is pale silty clay loam in the upper part, light gray fine sandy loam in the middle part, and very pale brown fine sand in the lower part.

The Thurman soils are deep, somewhat excessively drained, and mainly on side slopes. They are below the Moody soils on the landscape and are gently sloping and strongly sloping. The typical Thurman soil has a surface layer of grayish brown, friable loamy fine sand about 9 inches thick. Beneath this is a transitional layer of pale brown, loose loamy fine sand about 6 inches thick. The underlying material to a depth of 60 inches is very pale brown fine sand.

Of minor extent in this association are silty Alcester soils on foot slopes, Nora soils on the upper part of side slopes, and calcareous Crofton soils on the middle part of the side slopes.

The soils in this association are used as farmland. The farms are diversified and are mainly a combination of cash grain and livestock operations. The main crops are corn, alfalfa, and winter wheat. Some areas are in introduced or native grasses. Both dryland and irrigated crops are grown. Irrigation is by the sprinkler method. The potential for irrigation is high. Some feedlots for cattle and hogs are on this association.

Soil blowing and water erosion are the main hazards on this association. Conserving water and improving the level of fertility are the main concerns of management.

The farms average about 400 acres. Some areas of the Thurman soils in this association have been mined for sand for construction. Farm produce is marketed mainly within the county, but some livestock are shipped to terminal markets outside the county.

Loamy and silty soils on stream terraces

Two associations are in this group. The soils are nearly level and well drained. Nearly all of the acreage of this group is farmland, mainly irrigated farmland. Irrigation is mainly by the gravity system, but in some areas the sprinkler type system is used. Soil blowing is the main hazard. Many areas are droughty. Conserving moisture for use by plants and maintaining high soil fertility are the main concerns of management.

7. Blendon association

Deep, nearly level, well drained loamy soils that formed in alluvium; on stream terraces

The soils in this association are on a stream terrace of the Platte River Valley. The terrace merges gradually with the adjacent bottom lands. The soils are nearly level (fig. 5).

This association makes up about 3 percent of the county. It is about 85 percent Blendon soils and 15 percent soils of minor extent.

The Blendon soils are deep, well drained, and nearly level. Typically, the surface layer is dark grayish brown, friable fine sandy loam about 8 inches thick. The subsoil is friable fine sandy loam about 26 inches thick. The upper part is dark grayish brown, and the lower part is brown. The underlying material to a depth of 60 inches is pale brown loamy sand in the upper part, light gray sand in the middle part, and light gray gravelly sand in the lower part.

Of minor extent in this association are Lawet, Shell, and Ord soils. The Lawet and Ord soils are at slightly lower elevations, and the Shell soils are at about the same elevation as the Blendon soils.

Most of the acreage of this association is in cultivated crops that are irrigated. The principal crops are corn and soybeans. Grain sorghum and alfalfa are grown in places. Most areas are irrigated with well water. The potential for irrigation is medium in the areas that are not irrigated. Most of the more desirable areas are already irrigated.

Conserving water and maintaining good tilth and high fertility are the main concerns of management in this association. Droughtiness is a hazard under dryland farming. Soil blowing is the main hazard. Maintaining a good cover of crop residue helps reduce soil blowing.

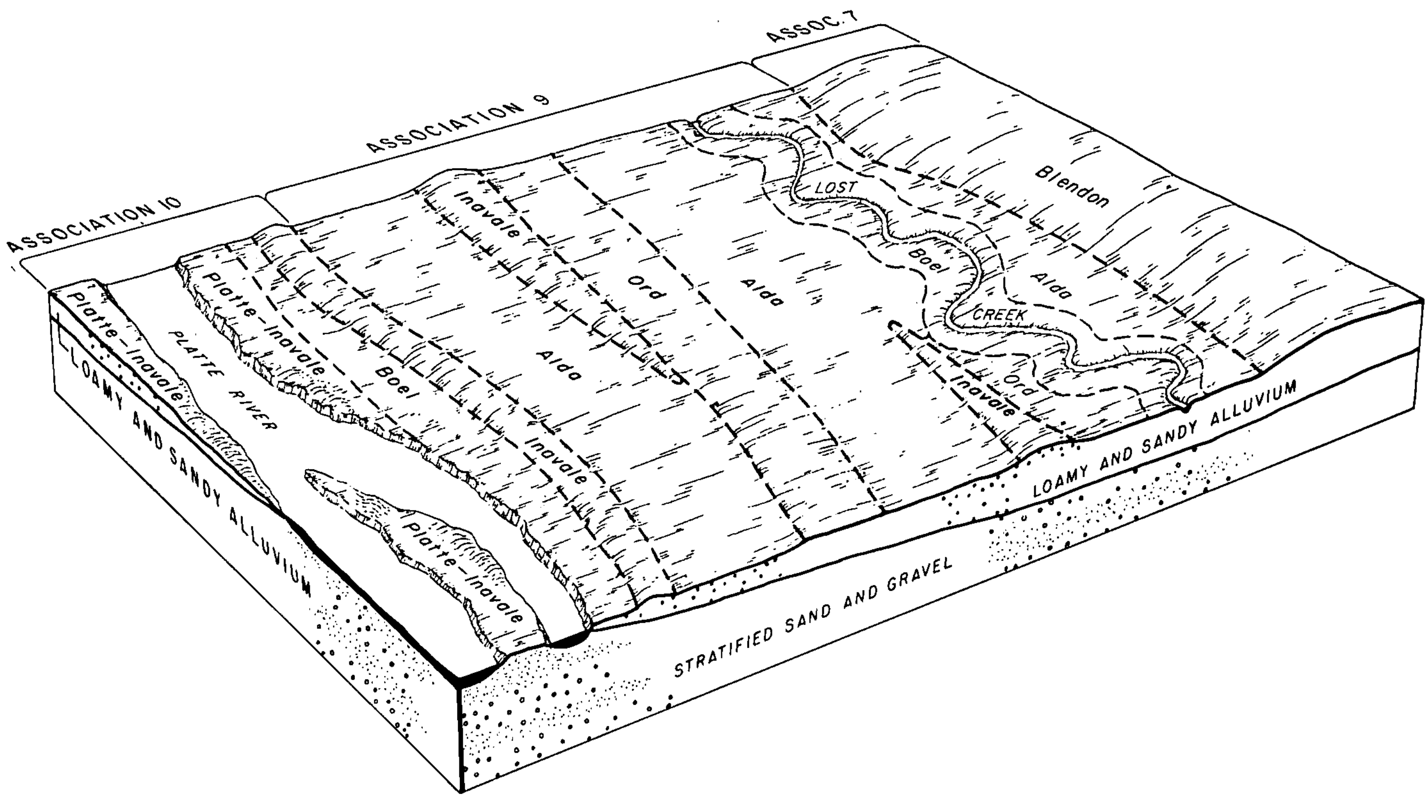

Figure 5.—Typical pattern of soils and parent material in associations 7, 9, and 10.

The farms on this association average about 240 acres and are mainly cash grain operations. Most of the grain and hay produced on this association is utilized on the farm. Most livestock is marketed in Schuyler or Richland.

8. Hall association

Deep, nearly level, well drained silty soils that formed in loess, colluvium, and alluvium; on stream terraces

This association consists of nearly level soils on a stream terrace of the Platte River Valley.

This association makes up about 1 percent of the county. It is about 79 percent Hall soils and 21 percent soils of minor extent.

These deep, well drained Hall soils are some of the most productive soils in the county. Typically, the surface soil is very dark grayish brown, friable silty clay loam I6 inches thick. It is dark gray in the upper part and dark grayish brown in the lower part. The subsoil is friable silty clay loam about 22 inches thick. The upper part is dark grayish brown, the middle part is dark brown, and the lower part is brown. The underlying material to a depth of 60 inches is yellowish brown fine sandy loam and loamy sand.

Of minor extent in this association are the well drained Blendon soils on a terrace break to the bottom lands and the silty Alcester soils on adjacent foot slopes of the loess uplands.

The farms on this association are primarily cash crop operations. A few cattle and hogs are fattened on the farm. Most of the acreage is farmed and irrigated. Corn is the principal crop. Alfalfa is grown for livestock feed, and some soybeans are raised as a cash crop. Most irrigation is by the gravity method, but there is also some sprinkler irrigation.

There are few hazards to crop production in this association. A few areas need leveling for better surface drainage. Soil blowing is a problem on the soils of minor extent. Conserving water and maintaining the high level of fertility are the main concerns of management.

The farms average about 400 acres. Markets for farm produce are available within the county or at nearby terminals in Omaha and Sioux City.

Loamy and sandy soils on bottom lands

Two associations are in this group. The soils are nearly level to strongly sloping and are somewhat poorly drained and somewhat excessively drained. Most of the

acreage of this group is in introduced or native grasses, which are grazed or mowed for hay or are maintained for recreation use. A small acreage is cultivated, and most of this is irrigated. Irrigation is mainly by the center-pivot system. The main limitations are wetness caused by the high water table in spring and droughtiness after the water table recedes late in summer. Flooding is the main hazard. Maintaining the grasses in good condition and improving the fertility of the cultivated soils are important concerns of management.

9. Alda-Ord association

Nearly level, somewhat poorly drained loamy soils that are moderately deep and deep to mixed sand and gravel; formed in alluvium on bottom lands

This association consists of nearly level soils on bottom lands of the Platte River Valley. In some of the lower lying areas are narrow, shallow channels of streams that flow only after heavy rains.

This association makes up about 6 percent of the county. It is about 28 percent Alda soils, 28 percent Ord soils, and 44 percent soils of minor extent.

The Alda soils are moderately deep to mixed sand and gravel, nearly level, and somewhat poorly drained. They are slightly lower on the landscape than Ord soils. Typically, the surface layer is dark gray, very friable, calcareous loam about 10 inches thick. The underlying material to a depth of 60 inches is very pale brown, stratified sandy loam in the upper part, fine sand in the middle part, and coarse sand in the lower part. The lower part has yellow mottles.

The nearly level Ord soils are on the higher parts of the landscape. They are deep and somewhat poorly drained. Typically, the surface layer is very friable fine sandy loam about 16 inches thick. It is dark gray in the upper part and stratified gray and light gray in the lower part. The underlying material to a depth of 60 inches is light brownish gray, mottled, calcareous fine sandy loam in the upper part and light gray, mottled fine sand in the lower part.

Of minor extent in this association are the sandy Inavale soils at the highest elevations. Platte soils, which are shallow to mixed sand and gravel, are at the lowest elevations. The well drained Eudora soils are higher on the landscape than the major soils.

Most of the acreage of this association is in native grasses; some acreage is cultivated. The grass is cut for hay or is used for grazing. Most of the cattle are in small cow-calf herds. Cattle are fattened in feedlots. Corn and alfalfa, the principal crops, are grown under both dryland and irrigation management.

Sprinkling is the principal method of irrigation. Wetness caused by the water table is the main limitation if the soils are cultivated. Maintaining the fertility of the soil and controlling the occasional flooding are problems on cultivated land. Proper grazing use and timely haying are the major management concerns on the rangeland.

The farms are about 400 acres on the average. The sand and gravel beneath this association are good materials for construction. There are only a few roads on this association.

10. Platte-Inavale association

Nearly level to strongly sloping, somewhat poorly drained and somewhat excessively drained loamy and sandy soils that are shallow and deep to mixed sand and gravel; formed in alluvium on bottom lands

This association is on bottom lands of the Platte River Valley. The soils are nearly level to strongly sloping and are generally in long, narrow areas. Some areas are islands within the braided channels of the river. Most of this association has a seasonal high water table that ranges in depth from 1 to 3 feet.

This association makes up about 1 percent of the county. It is about 47 percent Platte soils, 31 percent Inavale soils, and 22 percent soils of minor extent.

The Platte soils are nearly level and are on the lower parts of the landscape. They are somewhat poorly drained and shallow to mixed sand and gravel. Typically, the Platte soils have a surface layer of very friable, light brownish gray loam about 11 inches thick. The underlying material to a depth of 60 inches consists of stratified light gray and light brownish gray, mottled fine sandy loam in the upper 6 inches and of light gray coarse sand with 8 percent gravel in the lower part.

The Inavale soils are nearly level to strongly sloping and on the higher parts of the landscape. They are deep and well drained. Typically, the surface layer is dark grayish brown, loose loamy fine sand about 7 inches thick. A transition layer of light brownish gray, loose loamy fine sand about 8 inches thick is beneath the surface layer. The underlying material to a depth of 60 inches is light gray fine sand.

Of minor extent in this association are the Alda soils, which are moderately deep to mixed sand and gravel and are slightly higher on the landscape than the Platte soils but lower than Inavale soils. The deep Boel and Ord soils are between Platte and Inavale soils also.

Areas of this association are used mainly for grazing. These areas are also used as habitat for wildlife and for recreation, mainly hunting.

Mixed woodland and, in a few small areas, native grasses dominate the vegetation. Eastern cottonwood and eastern redcedar are the dominant trees. Shrubs in the understory include wild rose, currant, dogwood, snowberry, sumac, and buckbrush.

Frequent flooding is the main hazard, and wetness caused by the seasonal high water table is the main limitation. Improving the vegetation for use by livestock and wildlife is the main concern of management.

Permanent dwellings are not common, but cabins for recreation uses are common. There are few roads on the association.

Silty, highly calcareous soils on bottom lands

The soils in this group are nearly level and poorly drained. Most of the acreage of this group is cultivated, and a large part of this cultivated acreage is irrigated. Both sprinkler and gravity systems are used. Some areas are in native grasses, which are cut for hay. Poor soil drainage is the main limitation. Providing proper drainage and dealing with the excessive amount of carbonates in the soil are the main concerns of management.

11. Lawet association

Deep, nearly level, poorly drained silty soils that formed in alluvium; on bottom lands

This association is on bottom lands of the Platte River Valley. The soils are nearly level. The seasonal high water table is between depths of 1 and 2 feet. The water table recedes to a depth of 3 or 4 feet in summer.

This association makes up about 4 percent of the county. It is about 95 percent Lawet soils and 5 percent soils of minor extent.

The Lawet soils are deep, poorly drained, and highly calcareous. Typically, the surface layer is dark gray and gray friable silty clay loam 24 inches thick. The subsoil is gray, friable clay loam about 8 inches thick. The underlying material to a depth of 60 inches is light gray silty clay loam in the upper part, light brownish gray sandy clay loam in the middle part, and light gray sand in the lower part.

Of minor extent in this association are the well drained Shell soils in the higher lying areas and the poorly drained Zook soils in the lower lying areas.

The farms on this association are diversified, combining mainly cash crop and livestock operations. Much of the acreage of this association is cultivated, but a fairly large acreage is still in native grasses. Corn is the principal crop. Grain sorghum and small grain are also grown. The carbonate content of Lawet soils is too high for good production of soybeans. Alfalfa may die if the soil is not drained. Some areas are tile drained. Sprinkler and gravity methods are used to irrigate a large part of the association. Areas in native grass are used primarily as hayland. A few farms have small cow-calf herds, and some cattle are fattened in the feedlot.

Wetness caused by the high water table is the main limitation in this association. The carbonates in the soil limit the choice of crops and are, therefore, a concern of management.

The farms on this association average about 360 acres. Most of the produce is marketed in Schuyler or Richland. Some livestock is shipped to terminal markets outside the county.

Silty soils on bottom lands

The soils in this group are nearly level and are poorly drained and well drained. Nearly all of the acreage of this group is farmed, and most of the farmland is irrigated. Irrigation is by either the gravity or sprinkler method. Wetness of the poorly drained soils is the main limitation. Maintaining high fertility, providing good water management, and improving tilth are the main concerns of management.

12. Zook-Shell-Hobbs association

Deep, nearly level, poorly drained and well drained silty soils that formed in alluvium; on bottom lands

This association is on bottom lands of the Platte River Valley and in the narrower valleys, primarily of Maple Creek, Shell Creek, Rawhide Creek, Taylor Creek, and Dry Creek. The soils are nearly level (fig. 6).

This association makes up about 15 percent of the county. It is 32 percent Zook soils, 32 percent Shell soils, 20 percent Hobbs soils, and 16 percent soils of minor extent.

The nearly level Zook soils are on lowest parts of the landscape. They are deep, poorly drained soils. Typically, the surface soil is about 27 inches thick. The upper part is dark gray, firm silty clay loam; the middle part is very dark gray, firm silty clay loam; and the lower part is very dark gray, very firm silty clay. The subsoil is very dark gray, very firm silty clay about 9 inches thick. The underlying material to a depth of 60 inches is silty clay. The upper part is dark gray, and the lower part is gray and mottled.

The Shell soils in this association are nearly level and are on the highest parts of the landscape. They are deep and well drained. Typically, the surface layer is grayish brown, very friable silt loam about 24 inches thick. The underlying material to a depth of 60 inches is silt loam that is stratified grayish brown and light brownish gray silt loam in the upper part. It is dark grayish brown and light brownish gray in the lower part. In some areas, silty clay is below a depth of 40 inches.

The Hobbs soils are nearly level and are between the Zook and Alcester soils on the landscape. They are deep, well drained soils. Typically, the surface layer is grayish brown, very friable silt loam about 7 inches thick. The underlying material to a depth of 60 inches is thinly stratified silt loam. It is grayish brown in the upper part and dark gray in the lower part.

Of minor extent in this association are the poorly drained Luton and Napa soils, which are at slightly lower elevations than Zook soils. The somewhat poorly drained Colo soils are slightly higher on the landscape than Zook soils, but lower than the Shell or Hobbs soils. Alcester soils are on adjacent foot slopes.

Most of the acreage of this association is farmed. The principal crops are corn, soybeans, grain sorghum, and winter wheat. Most of the acreage is irrigated. A gravity or sprinkler system is used, and the water is pumped from wells.

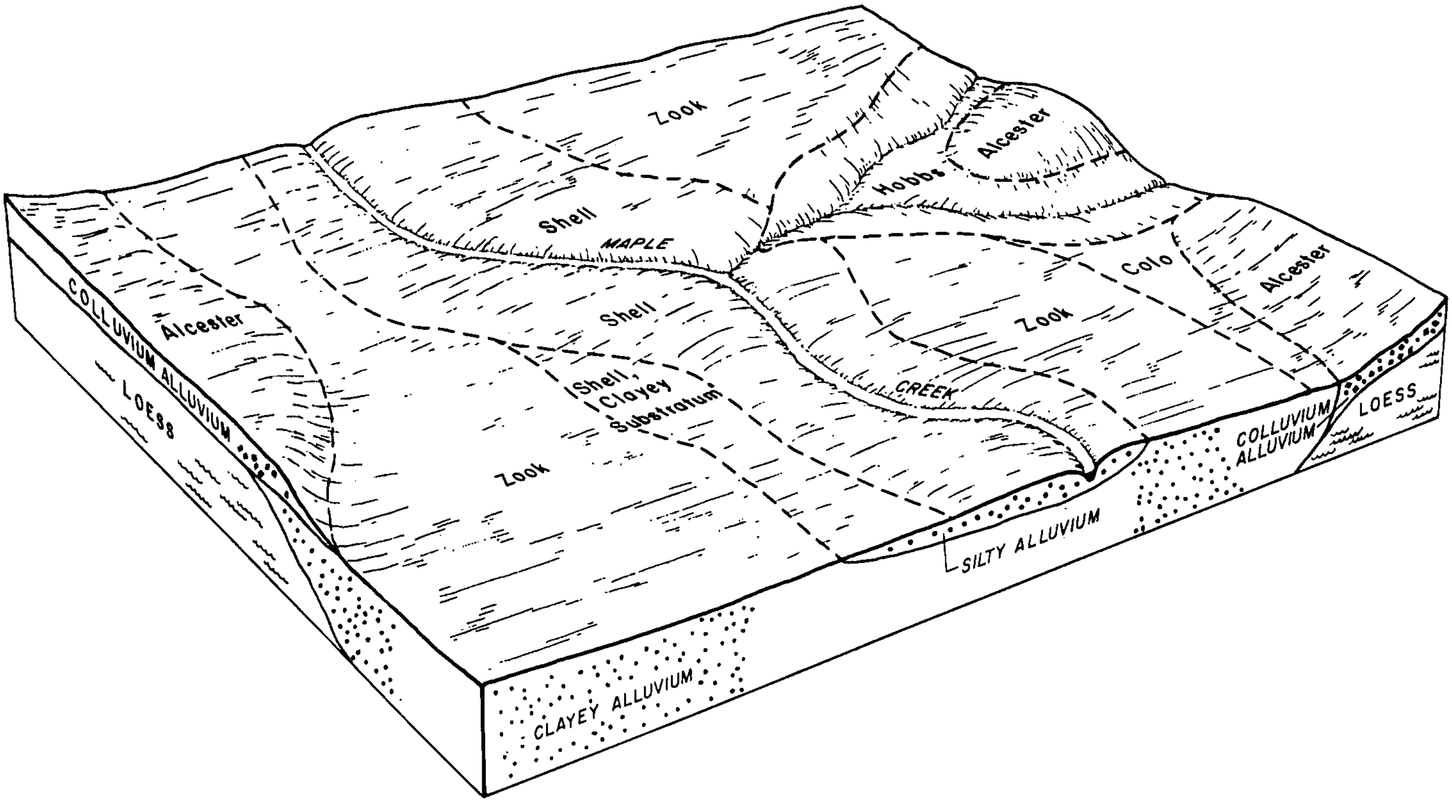

Figure 6.—Typical pattern of soils and parent material in the Zook-Shell-Hobbs association.

Wetness is the main limitation, and occasional flooding is the main hazard on this association. Surface drainage is needed in areas of the Zook and Colo soils. Maintaining high fertility, improving tilth of the fine textured soils, and providing good water management are the main management concerns.

Farms on this association average about 400 acres. The farmsteads are mainly in the well drained areas. The farms are diversified and mainly consist of a combination cash grain and livestock operation. Soybeans are grown for cash. Much of the grain and hay is fed to cattle and hogs that are being fattened for market. Most cash crops and livestock are marketed locally. Some livestock are shipped to terminal markets outside the county.

Detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Moody silty clay loam, 2 to 6 percent slopes, is one of several phases in the Moody series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Thurman-Moody complex, 6 to 11 percent slopes, eroded, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits and dumps is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Some soil boundaries and soil names may not fully match those of adjoining areas that were published at an earlier date. This is a result of changes and refinements in series concepts, different slope groupings, and application of the latest soil classification system.

Soil descriptions

AcC—Alcester silt loam, 2 to 6 percent slopes. This deep, well drained gently sloping soil is on foot slopes adjacent to loess uplands. Areas range from 5 to 200 acres in size.

Typically, the surface soil is dark grayish brown and friable and about 24 inches thick. The upper part is silt loam, and the lower part is light silty clay loam. The subsoil is friable silty clay loam about 12 inches thick. The upper part is grayish brown, and the lower part is brown. The underlying material to a depth of 60 inches is light yellowish brown silt loam.

Included with this soil in mapping are small areas of nearly level Shell soils on lower parts of the landscape. These included soils make up 3 to 8 percent of the map unit.

Permeability is moderate in this Alcester soil, and available water capacity is high. Moisture is readily released to plants. The organic matter content is moderate, and natural fertility is high. Runoff is slow. Tilth is good. The rate of water intake is moderately low.

Most of the acreage of this soil is farmed. Most farmed areas are used for dryland farming, but a few are irrigated. A few small areas are in introduced grasses that are grazed.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. The main hazard is erosion by water, and the main management concern is conservation of the surface

water. Runoff from soils on higher lying slopes needs to be controlled. Terraces and grassed waterways help prevent soil and water loss. Conservation tillage practices, which keep all or part of the crop residue on the surface, help conserve moisture.

Under irrigation, this soil is suited to such row crops as corn and soybeans and to such close-growing crops as alfalfa. Soil erosion by water is the main hazard. Contour furrows can be used if terraces and grassed waterways are constructed to control the runoff from higher lying soils. Conservation tillage practices help control erosion. This soil is suited to sprinkler irrigation systems, particularly the center-pivot system. If runoff from the higher lying soils is controlled, bench leveling can be used to reduce the gradient so that a gravity system can be used for row crops.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet can cause compaction and reduce the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, properly planted on a well prepared site, can survive and grow well. Weeds can be controlled by cultivating between the tree rows and by hand hoeing or careful use of herbicides in the rows. Contour planting or the use of a cover crop can help control erosion. Newly planted trees may need watering because of insufficient rainfall.

This soil is suited to use as septic tank absorption fields. For sewage lagoons, grading is needed to modify the slope and shape the lagoon. Sewage lagoons need to be lined or sealed to prevent seepage. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good drainage. Crowning the road by grading and constructing adequate side ditches can provide the needed surface drainage.

This soil is assigned to capability units IIe-1 dryland and IIIe-4 irrigated, Silty range site, and windbreak suitability group 3.

Af—Alda fine sandy loam, 0 to 1 percent slopes. This is a nearly level, somewhat poorly drained soil on bottom lands of the Platte River Valley. It formed in alluvium and is moderately deep over coarse sand or gravelly sand. It is occasionally flooded. Areas ranges from 3 to 100 acres in size.

Typically, the surface layer is very friable, calcareous fine sandy loam about 10 inches thick. It is grayish brown in the upper part and gray in the lower part. The upper part of the underlying material is mottled light gray very fine sandy loam about 10 inches thick, and the middle part is light gray very fine sand about 10 inches thick. The lower part to a depth of 60 inches is light gray gravelly sand. In some areas, the lower part of the underlying material is fine sand.

Included with this soil in mapping are small areas of Inavale and Platte soils. The Inavale soils are better drained, do not contain gravel, and are on slightly higher parts of the landscape than the Alda soil. The Platte soils have mixed sand and gravel at a depth of 10 to 20 inches and are slightly lower on the landscape than the Alda soil. The included soils make up 2 to 5 percent of the map unit.

This Alda soil has moderately rapid permeability in the upper part and very rapid permeability in the underlying gravelly sand. The available water capacity is low. Moisture is released readily to plants. The seasonal high water table ranges from a depth of about 2 feet in most wet years to a depth of about 3 feet in most dry years. Late in summer the water table recedes to a depth of about 5 feet. Growth of roots of the commonly grown crops is limited to the soil material above the gravelly sand. Organic matter content is moderate, and natural fertility is medium. Runoff is slow. The rate of water intake is moderately high.

Most of the acreage of this unit is in cultivated row crops that are irrigated by the center-pivot type of sprinkler system. The rest is in range.

Under dryland farming, this soil is suited to cultivated crops. Corn, soybeans, alfalfa, grain sorghum, and small grain are the common crops. Because of wetness in spring, this soil warms up more slowly than better drained soils; and as a result, tillage operations are slightly delayed. Late in summer, however, the water table is commonly as low as 5 feet and the soil is droughty. Tillage practices that keep crop residue on the surface, such as chiseling and no-tillage, help conserve moisture for crops, build up the supply of organic matter, and improve fertility.

Under irrigation, this soil is suited to such row crops as corn and soybeans and to such close-growing crops as alfalfa. Wetness, caused mainly by a high water table in spring, is the main limitation. Late in summer, droughtiness becomes a concern of management. This soil is suited to gravity irrigation systems, but it is better suited to sprinkler systems. The rate at which water is applied in a sprinkler system needs to be properly adjusted because the soil absorbs water readily. Applications should be frequent because of the low moisture retention capacity of the soil. Maintaining crop residue on the surface helps control soil blowing.

This soil is suited to introduced grasses for pasture. Such species as reed canarygrass and creeping foxtail grow well. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the pasture grasses in good condition.

Using grassed areas for rangeland or hayland is effective in controlling soil blowing. Overgrazing, untimely haying, and improper mowing height, however, reduce the protective cover. Overgrazing when the soil is wet can compact the soil. Restricting grazing when the soil is wet and timely deferment of grazing help keep the native plants in good condition.

This soil is fairly suited to trees and shrubs for windbreaks. Only those species tolerant of the moderately high water table and a limited root zone should be used. The herbaceous vegetation which grows on this soil is abundant. Cultivation between the tree rows and careful use of herbicides or rototilling in the rows help control undesirable weeds and grasses.

This soil generally is not suited to use as septic tank absorption fields or building sites because of occasional flooding. A suitable alternate site is needed. Sewage lagoons need to be lined or sealed to prevent seepage, and they can be diked as protection from flooding. They can also be constructed on fill material to raise the bottom of the lagoon above the seasonal high water table. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving.

The use of this soil as a site for roads is limited by the hazard of flooding and the hazard of frost action. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help prevent damage to the roads from flooding and wetness. Damage to the roads by frost action can be reduced by providing good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIIw-6 dryland and IIIw-9 irrigated, Subirrigated range site, and windbreak suitability group 2S.

Ag—Alda loam, 0 to 1 percent slopes. This nearly level, somewhat poorly drained soil is on bottom lands of the Platte River Valley. It formed in alluvium and is moderately deep over coarse sand and gravel. This soil is occasionally flooded. Areas range from 5 to 100 acres in size.

Typically, the surface layer is dark gray, very friable, calcareous loam about 10 inches thick. The underlying material to a depth of 60 inches is very pale brown. It is stratified sandy loam in the upper part and fine sand in the middle part. In the lower part, at a depth of about 36 inches, the underlying material is coarse sand that has yellow mottles.

Included with this soil in mapping are small areas of Inavale, Ord, and Platte soils. The Inavale soils do not contain gravel. They are sandy and better drained and are on slightly higher parts of the landscape than the Alda soil. The Ord soils have a coarser surface layer, have fine sand in the lower part of the underlying material, and are slightly higher on the landscape. The Platte soils have coarse sand and gravel at a depth of 10 to 20 inches and are slightly lower on the landscape than the Alda soil. The included soils make up 2 to 5 percent of this map unit.

Permeability is moderately rapid in the upper part of this Alda soil and very rapid in the underlying coarse sand and gravel. The available water capacity is low. Moisture is released readily to plants. The seasonal high water table ranges in depth from about 2 feet in most wet years to about 3 feet in most dry years. Late in summer the water table commonly recedes to a depth of about 5 feet. Growth of roots of the crops commonly grown is generally limited to the soil material above the coarse sand and gravel. The content of organic matter is moderate, and natural fertility is medium. Runoff is slow. The rate of water intake is moderate.

Most of the acreage of this unit is in cultivated row crops that are irrigated by center-pivot systems. The rest is in dryland crops or in pasture and range.

Under dryland farming, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and small grain. Because of wetness in spring, this soil warms up more slowly than better drained soils; and as a result, tillage operations are commonly delayed. Late in summer, however, the water table recedes and the soil becomes droughty. Conservation tillage practices, such as disking or no-tillage, keep crop residue on the surface and thus help conserve moisture for crops, build up the supply of organic matter, and control soil blowing.

Under irrigation, this soil is suited to such row crops as corn and soybeans and to close-growing crops, such as alfalfa. Wetness, caused mainly by a high water table in spring, is the main limitation. Late in summer, droughtiness is a concern of management. If sprinkler systems are used, application of water should be light and frequent because of the low moisture retention capacity of the soil. This soil is suited to gravity irrigation systems; however, land leveling is generally needed for an even distribution of water. The cuts must not expose the sand.

This soil is suited to introduced grasses for pasture. Such species as reed canarygrass and creeping foxtail grow well. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the pasture grasses in good condition.

Using grassed areas for rangeland is effective in controlling soil blowing. Overgrazing, untimely haying, and improper mowing height reduce the protective cover. In addition, grazing when this soil is wet can compact the soil. Restricting grazing when the soil is wet and timely deferment of grazing help maintain the native grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. It is suited only to species tolerant of the moderately high water table and limited root zone. The herbaceous vegetation which grows on this soil is abundant. Cultivation between the tree rows and careful use of herbicides or rototilling in the rows help control weeds and undesirable grasses.

This soil generally is not suited to use as septic tank absorption fields or building sites because of the occasional flooding. A suitable alternate site is needed. Sewage lagoons need to be lined or sealed to prevent seepage, and they can be diked as protection from flooding. They can also be constructed on fill material to raise the bottom of the lagoon above the seasonal high water table. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving.

The use of this soil as a site for roads is limited by the hazard of flooding and the hazard of frost action. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding and wetness. Damage to the roads by frost action can be reduced by providing good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIIw-4 dryland and IIIw-7 irrigated, Subirrigated range site, and windbreak suitability group 2S.

Be—Belfore silty clay loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil formed in loess on uplands. It is on some of the highest parts of the landscape. Areas range from 20 to 660 acres in size.

Typically, the surface layer is very dark grayish brown, firm silty clay loam about 6 inches thick. The subsurface layer is dark gray, firm silty clay loam about 10 inches thick. The subsoil is firm silty clay loam about 27 inches thick. It is brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is very pale brown silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Fillmore soils in shallow depressions and the gently sloping Moody soils on narrow ridgetops and side slopes of uplands. The included soils make up 5 to 8 percent of this map unit.

Permeability is moderately slow in this Belfore soil, and available water capacity is high. Moisture is released slowly to plants. Organic matter content is moderate. Runoff is slow. The subsoil has a high shrink-swell potential. Natural fertility is high. The rate of water intake is low.

Most of the acreage of this unit is in cultivated row crops. There are small pastures of smooth brome adjacent to some farmsteads. A small part of the cultivated acreage is in dryland crops, and the rest is irrigated, generally by a center-pivot sprinkler system.

Under dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Row crops can be grown in consecutive years if proper amounts and kinds of fertilizer are applied and if weeds and insects are controlled. Conservation of water is an important concern of management. Mulch planting and the conservation of crop residue help conserve moisture for use by crops, build up the supply of organic matter, and improve fertility. Lime is generally needed to reduce soil acidity if alfalfa is to be grown.

Under irrigation, this soil is suited to such row crops as corn and soybeans and to such close-growing crops as alfalfa. Gravity and sprinkler methods of irrigation can be used. Land leveling and a tailwater recovery system can be used to make efficient use of the water if a furrow system of irrigation is used. The soil is well suited to the center-pivot type of sprinkler system.

This soil is suited to introduced grasses for pasture. Smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa are common. Overgrazing or grazing when the soil is too wet can cause surface compaction and reduce the water intake rate. Proper grazing, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. If the soil cracks when it is dry, light cultivation and supplemental watering will help close the cracks and protect the roots from dessication. Weeds can be controlled by cultivating between the rows of trees or by careful use of herbicides and hand hoeing within the rows. At times, rainfall is insufficient and newly planted trees need supplemental watering.

The use of this soil as septic tank absorption fields is limited by the moderately slow permeability, but this limitation can generally be overcome by increasing the size of the absorption field. This soil is generally suited to sewage lagoons. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage from the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for the subgrade or base insures better performance. Mixing the base material with additives, such as hydrated lime, helps prevent shrinking and swelling.

This soil is assigned to capability units I-1 dryland and I-3 irrigated, Clayey range site, and windbreak suitability group 3.

Bf—Belfore silty clay loam, terrace, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on stream terraces. Areas range from 10 to 500 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 14 inches thick. The subsoil is brown, firm silty clay loam about 18 inches thick. The underlying material to a depth of 60 inches is pale brown silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Fillmore soils in shallow depressions. These included soils make up 1 to 4 percent of the map unit.

Permeability is moderately slow in this Belfore soil, and available water capacity is high. Moisture is released

slowly to plants. The content of organic matter is moderate, and runoff is slow. The subsoil has high shrink-swell potential. Natural fertility is high. The rate of water intake is low.

Most of the acreage of this soil is in cultivated row crops. There are small areas of smooth brome pasture adjacent to some farmsteads. Much of the cultivated acreage of this soil is under dryland management; the rest is irrigated.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Row crops can be grown in consecutive years if a high level of management is used. Conservation of water is an important concern of management. Tillage practices that keep crop residue on the surface help conserve moisture for use by crops and make the soil more friable. Lime is generally needed to reduce acidity if alfalfa is to be grown.

Under irrigation, this soil is suited to such row crops as corn and soybeans and to such close-growing crops as alfalfa. This soil becomes cloddy if tilled when wet. Runoff from higher lying areas can be controlled by the use of diversions and terraces in those areas. Land leveling and a tailwater recovery system can be used to increase the efficiency of a gravity system of irrigation. This soil is well suited to the center-pivot system of sprinkler irrigation. The rate at which water is applied should be adjusted so that it does not exceed the intake rate of the soil.

This soil is suited to introduced grasses for pasture or hay. The pastures commonly consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Haying, overgrazing, or grazing when the soil is too wet can cause surface compaction and reduce the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses and the soil in good condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, properly planted on a well prepared site, can survive and grow well. Weeds can be controlled by cultivating between tree rows and by hand hoeing, rototilling, or careful use of appropriate herbicides in the rows. At times, rainfall is insufficient and young trees need watering.

The use of this soil as septic tank absorption fields is limited by the moderately slow permeability, but this limitation can generally be overcome by increasing the size of the absorption field. This soil is generally suited to sewage lagoons. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Mixing the base material for roads and streets with additives such as hydrated lime helps prevent shrinking and swelling.

This soil is assigned to capability units I-1 dryland and I-3 irrigated, Clayey range site, and windbreak suitability group 3.

Bh—Blendon fine sandy loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on stream terraces. Areas range from 20 to 3,000 acres in size.

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 8 inches thick (fig. 7). The subsoil is very friable fine sandy loam about 26 inches thick. The upper part is dark grayish brown, and the lower part is brown. The underlying material to a depth of 60 inches is pale brown loamy sand in the upper part, light gray sand in the middle part, and light gray gravelly sand in the lower part. In some places, a 4- to 12-inch layer of loam or very fine sandy loam is at a depth of 24 to 36 inches.

Included with this soil in mapping are small areas of the silty Shell soils on similar parts of the landscape and the somewhat poorly drained Ord soils on slightly lower parts of the landscape. These included soils make up 2 to 4 percent of this map unit.

Permeability is moderately rapid in the subsoil of this Blendon soil and rapid in the underlying material. Available water capacity is moderate. Moisture is readily released to plants. Organic matter content is moderate, and natural fertility is medium. Runoff is slow. The rate of water intake is moderately high.

Almost one-fourth of the acreage of this soil is in urban development. The rest is in cultivated row crops, which are irrigated mainly by the gravity method. In a few areas, sprinkler irrigation is used.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Row crops can be grown in consecutive years if a high level of management is used. Droughtiness and soil blowing are common problems where the soil is not irrigated. Tillage practices that keep crop residue on the surface—disking or chiseling, for example—help control soil blowing and conserve moisture for use by crops.

Under irrigation, this soil is suited to such row crops as corn and soybeans and to such close-growing crops as alfalfa. Land leveling is needed for efficient control of the water if a furrow system is used. Conservation tillage systems can be used to prevent soil blowing. This soil is suited to gravity and sprinkler irrigation systems.

This soil is suited to pastures of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Proper stocking and rotation grazing help keep the grasses in good condition. Pastures may respond to nitrogen and phosphate fertilizers and to irrigation.

This soil is suited to trees and shrubs for windbreaks and to plantings for wildlife. It is best suited to those species that are tolerant of somewhat droughty conditions. Droughtiness and soil blowing are the principal hazards to the use of this soil for establishing

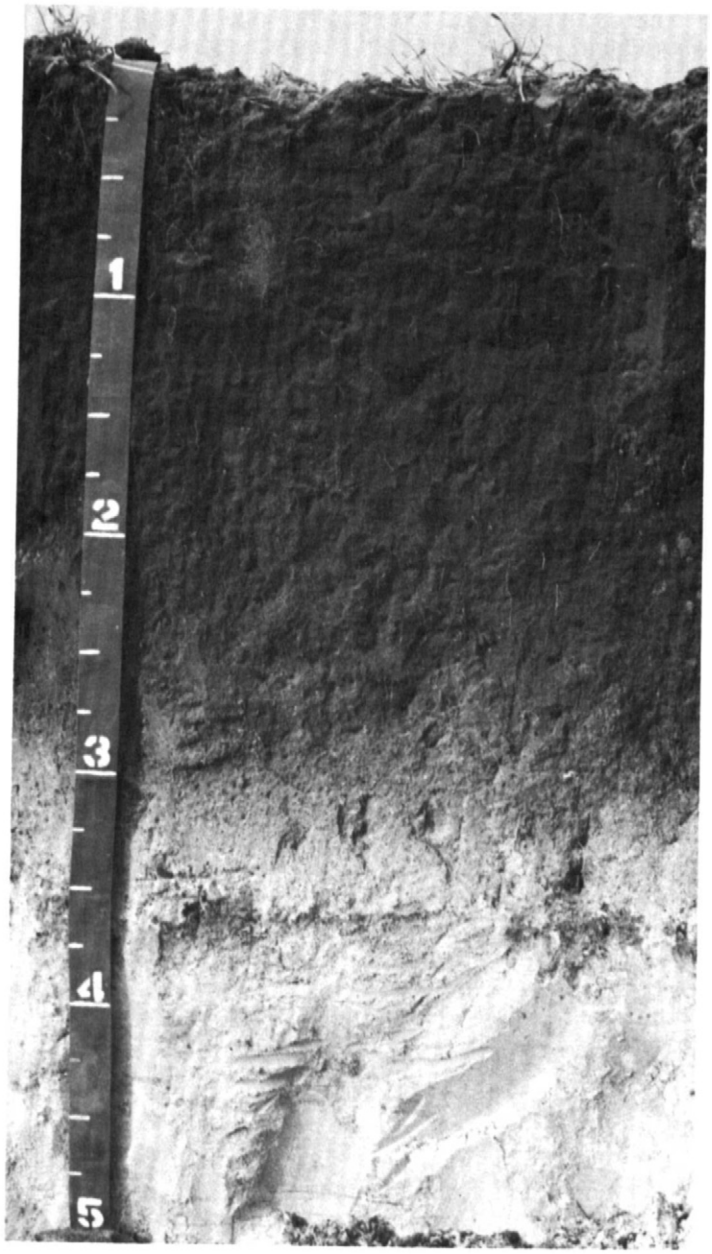

Figure 7.—Typical profile of Blendon fine sandy loam, 0 to 2 percent slopes. This soil has a dark surface layer. The scale is in feet.

small trees. Soil blowing can be reduced or prevented by maintaining strips of sod or a cover crop between the tree rows. Cultivation should be restricted to the tree rows. Irrigation can supply needed moisture when rainfall is insufficient.

This soil readily absorbs the effluent from septic tanks, but it does not adequately filter the effluent. The poor filtering capacity may result in pollution of the ground water. Sewage lagoons should be sealed or lined to prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. This soil is generally suited to use as a site for dwellings and small commercial buildings. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIs-6 dryland, IIe-8 irrigated, Sandy range site, and windbreak suitability group 5.

BnC—Blendon loam, 2 to 6 percent slopes. This deep, gently sloping, well drained soil is on a break from a stream terrace to the adjacent bottom lands of the Platte River Valley. Areas are long and narrow and range from 130 to 200 acres in size.

Typically, the surface layer is very dark grayish brown and dark grayish brown, very friable loam 15 inches thick. The subsoil is brown, very friable sandy loam 10 inches thick. The underlying material to a depth of 60 inches is brown loamy sand in the upper part and very pale brown sand in the lower part.

Included with this soil in mapping are small areas of soils, slightly higher on the landscape, that have a surface layer of loamy sand or sand. These included soils make up about 2 to 5 percent of the map unit.

Permeability is moderately rapid in the subsoil of this Blendon soil and rapid in the underlying material. Available water capacity is moderate. Moisture is readily released to plants. The organic matter content is moderate, and natural fertility is medium. Tilth is good. Runoff is slow. The rate of water intake is moderately high.

Most of the acreage of this soil is farmed. Most cultivated areas are irrigated. A few areas are in introduced grasses and used for grazing or haying.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, alfalfa, and small grain. Droughtiness is the main limitation. Tillage practices that keep all or part of the crop residue on the surface help control soil blowing and water erosion. Terraces and contour farming can help prevent loss of both water and soil.

Under irrigation, this soil is suited to such row crops as corn and soybeans and to such close-growing crops as alfalfa. It is well suited to the center-pivot system; however, frequent and light applications of irrigation water are needed to prevent leaching of the plant nutrients. This soil is suited to gravity systems of irrigation, such as bench leveling. Tillage practices that keep crop residue on the surface help control water erosion and soil blowing. Contour furrows should be used with terraces. The length of run should be limited.

This soil is suited to introduced grasses for pasture, commonly smooth brome or a combination of smooth brome and a legume. Proper stocking, rotation grazing,

and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Only species that can tolerate droughtiness should be selected. Competition from weeds and grass and droughtiness are common problems. Weeds can be controlled by cultivating between the tree rows and by hand hoeing or careful use of herbicides within the rows.

This soil readily absorbs the effluent from septic tanks, but it does not adequately filter the effluent. The poor filtering capacity may result in pollution of the ground water. Sewage lagoons need to be lined or sealed to prevent seepage. This soil is generally suited to use as a site for dwellings. If it is used as a site for a small commercial building, the building should be designed to complement the slope, or the site should be graded. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIIe-1 dryland and IIIe-8 irrigated, Silty range site, and windbreak suitability group 3.

Bo—Boel fine sandy loam, 0 to 2 percent slopes. This deep, somewhat poorly drained soil is on bottom lands. Areas are near channels of the Platte River and Lost Creek and are occasionally flooded. They range from 10 to 600 acres in size.

Typically, the surface layer is dark gray, very friable, calcareous fine sandy loam about 10 inches thick. Beneath this is a transition layer of grayish brown, very friable loamy sand about 4 inches thick. The underlying material to a depth of 60 inches is light gray and very pale brown fine sand. In some places, the underlying material is coarse sand.

Included with this soil in mapping are small areas of the sandy Inavale soils on higher parts of the landscape and the Platte soils on slightly lower parts of the landscapes. The included soils make up 3 to 5 percent of the map unit.

Permeability of this Boel soil is rapid, and available water capacity is low. Moisture is released readily to plants. The seasonal high water table is at a depth of about 1.5 feet in most wet years and at a depth of about 3.5 feet in most dry years. The organic matter content is moderately low. Natural fertility is low. Runoff is slow, and the rate of water intake is moderately high.

Most of the acreage of this soil is in grassland consisting of introduced or native species. A small part is cultivated.

Under dryland farming, this soil is suited to corn, soybeans, alfalfa, grain sorghum, and small grain. Because of the droughtiness during the summer, when the water table is lowest, the soil is best suited to close-growing crops. Tillage practices that keep all or part of the crop residue on the surface help conserve moisture and prevent soil blowing. Flooding can generally be controlled by dikes or levees along the streams.

Under irrigation, this soil is suited to corn and soybeans. It is not suited to alfalfa because of excessive wetness. The wetness, caused mainly by a seasonal high water table, is the main limitation. In spring, tillage operations commonly are delayed by wetness. This soil is subject to flooding on an average of about once every 3 to 5 years, but crop loss due to this flooding normally is slight. This soil is suited to both sprinkler and gravity systems of irrigation. Because the underlying material is coarse textured, the length of run for a gravity irrigation system should be short. If this soil is irrigated by the gravity method, some land leveling generally is needed to provide even distribution of water and uniform drainage. Keeping crop residue on the surface helps conserve moisture and prevents soil blowing.

This soil is suited to introduced grasses for pasture. Such species as reed canarygrass and creeping foxtail grow well. Rotation grazing, proper stocking, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to rangeland use. Overgrazing, untimely haying, and use of improper mowing height reduce the protective cover and cause deterioration of the grasses. Timely deferment of grazing or haying and a planned grazing system help maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks and to plantings for recreation and wildlife areas. However, it is suited only to species that are tolerant of the moderately high water table. Cultivating between the tree rows and hand hoeing or rototilling in the rows control weeds and undesirable grasses. Supplemental watering of small trees may be needed during the summer, when the water table is lowest.

This soil generally is not suited to septic tank absorption fields, sewage lagoons, dwellings, and small commercial buildings because of flooding and wetness. A suitable alternate site is needed. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing roads on suitable, well compacted fill material above the flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding and wetness. Damage to roads by frost action can be reduced by providing good surface drainage and by use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability unit IIIw-6 dryland and IIw-11 irrigated, Subirrigated range site, and windbreak suitability group 2S.

Cg—Colo silty clay loam, 0 to 2 percent slopes. This deep, somewhat poorly drained, nearly level soil is on bottom lands of the Platte River Valley, Maple Creek,

Shell Creek, and narrow upland drainageways. In places the soil areas are adjacent to stream channels, and in other places they occur between the natural levee and the foot slopes adjacent to uplands. These areas are occasionally flooded. They range from 5 to 50 acres in size.

Typically, the surface soil is dark gray, friable silty clay loam about 24 inches thick. Beneath this is a transition layer of gray, firm silty clay loam about 13 inches thick. The underlying material to a depth of 60 inches is gray silty clay loam. In some places, the surface layer is grayish brown or light brownish gray silty clay loam 10 to 18 inches thick.

Included with this soil in mapping are small areas of Zook soils on lower parts of the landscape. These included soils make up 2 to 6 percent of the map unit.

Permeability of this Colo soil is moderately slow, and available water capacity is high. Moisture is released readily to plants. The seasonal high water table is at a depth of about 2 feet in most wet years and at a depth of about 3 feet in most dry years. Organic matter content and natural fertility are high. Runoff is slow. Shrink-swell potential is high. The rate of water intake is low.

Most of the acreage of this soil is farmed. Most cultivated areas are in dryland crops, but some are irrigated. A few small areas, generally near farmsteads, are in introduced or native grasses.

Under dryland farming, this soil is suited to corn, soybeans, small grain, grain sorghum, and alfalfa. Row crops can be grown in consecutive years under a high level of management. Wetness and occasional flooding in spring commonly delay tillage operations. Tile drainage or V-shaped surface ditches can be used to improve drainage.

Under irrigation, this soil is suited to corn, soybeans, and grain sorghum and to such close-growing crops as alfalfa. The main limitation is wetness caused by the seasonal high water table. This soil is flooded on an average of about once every 3 to 5 years, but crop loss due to this flooding is usually slight. This soil is somewhat difficult to work because it tends to form hard clods if tilled when wet. Perforated tile and V-shaped ditches help improve drainage. This soil is suited to gravity and sprinkler systems of irrigation.

This soil is suited to introduced pasture grasses. Such species as reed canarygrass and creeping foxtail grow well. Proper stocking, rotation grazing, and restriction on grazing during wet periods help keep the grasses and the soil in good condition. Fertilizer can help increase the growth and vigor of the grasses.

This soil is suited to rangeland use. Overgrazing or deposition of silt by flood water, however, reduces the native vegetative cover and allows invasion of undesirable plants. Proper grazing use and a planned grazing system help maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks; however, it is suited only to those species that are tolerant of a moderately high water table. Control of weeds and undesirable grasses is an important concern of management. Cultivating between the tree rows and hand hoeing or careful use of selected herbicides in the rows help control weeds.

This soil generally is not suited to septic tank absorption fields or buildings because of the occasional flooding and wetness. A suitable alternate site is needed. Sewage lagoons can be constructed if fill material is used to raise the bottom of the lagoon above the seasonal high water table. Sewage lagoons need to be diked for protection from flooding. Constructing roads on suitable, well compacted fill material above the flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding and wetness. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Mixing the base material with additives such as hydrated lime helps prevent shrinking and swelling.

This soil is assigned to capability units IIw-4 dryland and IIw-3 irrigated, Subirrigated range site, and windbreak suitability group 2S.

CrC2—Crofton silt loam, 2 to 6 percent slopes, eroded. This deep, well drained, gently sloping soil formed in loess. It is on side slopes and long, narrow ridgetops of uplands. Rills and small gullies commonly form during rains.

Typically, the surface layer is brown, friable, calcareous silt loam about 6 inches thick. Beneath this is a transition layer of light yellowish brown, friable, calcareous silt loam about 10 inches thick. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam. In some areas the surface layer and transition layer are silty clay loam.

Most of the original dark surface layer has been removed by erosion, and tillage is mainly in the lighter colored transition layer and, in places, in the underlying material.

Included with this soil in mapping are small areas of the better developed Nora soils on similar landscapes. These included soils make up 3 to 12 percent of this map unit.

Permeability of this Crofton soil is moderate, and available water capacity is high. Moisture is readily released to plants. Organic matter content and natural fertility are low. Runoff is moderate. Availability of phosphate is low due to the excessive amount of lime in the soil. The water intake rate is moderate.

Most of the acreage of this soil is cultivated. The rest is mainly in introduced grasses. Most cultivated areas are under dryland management, but some are irrigated.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. It is best suited to close-growing crops, but row crops can be

grown if steps are taken to control erosion, conserve moisture, and improve fertility. Erosion by water is the major hazard. Terracing, contouring, and the use of grassed waterways can help prevent erosion and conserve moisture. Tillage practices that keep crop residue on the surface conserve water for use by plants and help control water erosion and soil blowing. The excessive amount of free carbonates in this soil ties up phosphorus, thus making it unavailable for use by plants. Feedlot manure and commercial fertilizer can be used to supply phosphorus and nitrogen and thus help improve fertility.

Under irrigation, this soil is suited to corn and soybeans but is better suited to such close-growing crops as alfalfa. Erosion by water is the main hazard, and the low fertility is a main concern of management. Terraces, grassed waterways, and tillage practices that maintain a large amount of crop residue on the surface help prevent further erosion. Fertility can be improved by the use of feedlot manure and commercial fertilizers, especially phosphorus and nitrogen. This soil is suited to center-pivot sprinkler systems. It can be bench leveled to reduce the slope gradient for use with row crops, or row crops can be grown in contour furrows supplemented with terraces and grassed waterways.

This soil is suited to introduced grasses for pasture. Pastures commonly consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet compacts the soil and reduces the water intake rate. Rotation grazing, proper stocking, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, properly planted in a well prepared site, can survive and grow well. Erosion can be controlled by terracing and planting the trees on the contour or by planting a cover crop between the rows of trees. Weeds can be controlled by cultivating between the tree rows and by careful use of selected herbicides or hand hoeing in the rows. Newly planted trees may need watering because of insufficient rainfall.

This soil generally is suited to septic tank absorption fields, dwellings, and small commercial buildings. Sewage lagoons need to be lined or sealed to prevent seepage. Grading is required to modify the slope and shape the lagoon. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing goond subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for sue.

This soil is assigned to capability units IIIe-8 dryland and IIIe-6 irrigated, Limy Upland range site, and windbreak suitability group 8.

CrD2—Crofton silt loam, 6 to 11 percent slopes, eroded. This deep, well drained, strongly sloping soil formed in loess. It is on side slopes of uplands. Rills and small gullies form during heavy rains. Most of the original dark surface layer has been removed by erosion, and tillage is mainly in the lighter colored transition layer. In places, the underlying material is at the surface. Areas range from 5 to 60 acres in size.

Typically, the surface layer is brown, calcareous, friable silt loam about 5 inches thick. Beneath this is a transition layer of light gray, friable, calcareous silt loam about 9 inches thick. The underlying material to a depth of 60 inches is calcareous silt loam. It is light gray in the upper part and light brownish gray in the lower part (fig. 8). In places, the underlying material is noncalcareous, light gray, and mottled.

Included with this soil in mapping are small areas of the better developed Nora soils on similar landscapes. Small areas of the Steinauer soils, which formed in glacial till, are also on similar landscapes. The included soils make up 5 to 10 percent of the map unit.

Permeability of this Crofton soil is moderate, and available water capacity is high. Moisture is readily released to plants. Organic matter content and natural fertility are low. Runoff is rapid. Availability of phosphorus to plants is low. The rate of water intake is moderate.

Most of the acreage of this soil is cultivated. The rest of the acreage is mainly in introduced grasses for pasture. Most cultivated areas are under dryland management, but a few are irrigated.

Under dryland management, this soil is poorly suited to cultivated crops. Corn, grain sorghum, small grain, and alfalfa are the main dryfarmed crops. If used for dryland farming, the soil is best suited to close-growing crops that can effectively limit the erosion hazard. Conserving water and improving the fertility of the soil are concerns in management. A high level of management that adequately controls erosion and improves fertility is needed to successfully grow row crops. Tillage practices that keep crop residue on the surface help conserve water for use by plants and help control erosion. Terracing, contour farming, and the use of grassed waterways help conserve water and control erosion. The excessive amount of free carbonates ties up the phosphorus in the soil, making it unavailable for use by plants. The use of feedlot manure and commercial fertilizers, especially phosphorus and nitrogen, is needed to improve fertility.

Under irrigation, this soil is poorly suited to corn but is better suited to such close-growing crops as alfalfa. Erosion by water is the main hazard. Terraces, grassed waterways, and conservation tillage practices can help control erosion. Fertility can be improved by applying feedlot manure and commercial fertilizer, especially phosphorus, and by returning crop residue to the soil. This soil is better suited to a sprinkler system of irrigation than to a gravity system.

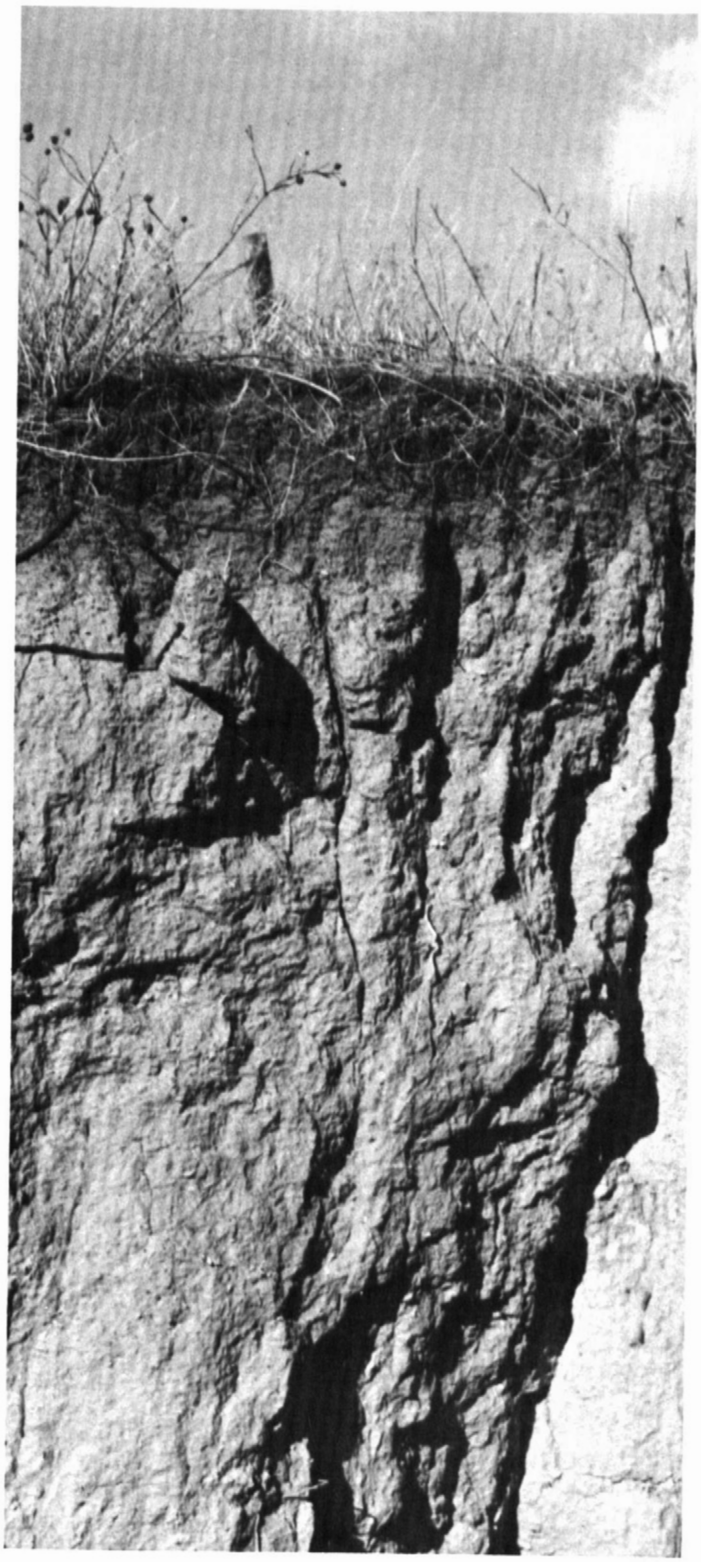

Figure 8.—Typical profile of Crofton silt loam, 6 to 11 percent slopes. This is a deep, calcareous soil that has a thin surface layer.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet causes soil compaction and reduces the water intake rate. Rotation grazing, proper stocking, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Planting healthy seedlings of adapted species on a well prepared site helps assure survival and satisfactory growth. Erosion can be controlled by terracing and planting on the contour or by planting a cover crop between the tree rows. Weeds can be controlled by cultivating between the tree rows and by hand hoeing or careful use of selected herbicides within the rows. Newly planted trees may need watering when droughty conditions persist.

The use of this soil as a site for sanitary facilities and buildings is limited by slope. For septic tank absorption fields, land shaping and installation of the tile lines on the contour generally are necessary. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Sewage lagoons also need to be lined or sealed to prevent seepage. If the soil is used as a site for dwellings and small commercial buildings, the structure should be designed to complement the slope, or the site should be graded. For roads and streets the pavement and subbase should be thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IVe-8 dryland and IVe-6 irrigated, Limy Upland range site, and windbreak suitability group 8.

CrE2—Crofton silt loam, 11 to 15 percent slopes, eroded. This moderately steep, deep, well drained soil formed in loess on side slopes of uplands. Rills and small gullies commonly form after heavy rains but are plowed in. Areas range from 5 to 30 acres in size.

Typically, the surface layer is pale brown, very friable, calcareous silt loam about 6 inches thick. Beneath this is a transition layer of pale brown, very friable, calcareous silt loam about 9 inches thick. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam. In places, the underlying material is noncalcareous, light gray, and mottled.

Most of the original dark surface layer has been removed by erosion, and tillage is mainly in the lighter colored transition layer and the underlying material.

Included with this soil in mapping are small areas of Nora soils on similar landscapes. Also included are areas of Steinauer soils, which formed in glacial till on similar landscapes. The included soils make up 5 to 10 percent of the map unit.

Permeability of this Crofton soil is moderate, and available water capacity is high. Moisture is readily released to plants. Organic matter content and natural fertility are low. Runoff is rapid. Availability of phosphorus is low. The rate of water intake is moderate.

Most of the acreage of this soil is cultivated and is mainly in dryland crops. A few small areas are in introduced grasses.

Under dryland management, this soil is poorly suited to close-growing crops and to row crops. Erosion by water is the main hazard. Farming on the contour and the use of terraces and grassed waterways help control erosion. Water conservation and maintenance of soil fertility are the main concerns of management. This soil contains an excessive amount of free carbonates, which tie up phosphorus, making it unavailable for use by plants. Conservation tillage practices, such as disking and no-tillage, keep crop residue on the surface and thereby help conserve water and control erosion. A properly planned fertilizer program and the use of feedlot manure help improve fertility.

This moderately steep soil is not suited to irrigation.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet can compact the soil, thereby reducing the water intake rate and increasing the hazard of erosion. Nitrogen fertilization, rotation grazing, and proper stocking can help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, planted in a well prepared site, can survive and grow well. Erosion can be controlled by terracing and planting trees on the contour or by using a cover crop between the tree rows. Weeds can be controlled by cultivating between the rows and by hand hoeing or careful use of herbicides in the rows. At times, rainfall is insufficient and newly planted trees need watering.

The use of this soil as a site for sanitary facilities and buildings is limited by slope. For septic tank absorption fields, land shaping and installation of the tile lines on the contour generally are necessary. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. Sewage lagoons also need to be lined or sealed to prevent seepage. If the soil is used as a site for dwellings and small commercial buildings, the building should be designed to complement the slope, or the site should be graded. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability unit IVe-8 dryland, Limy Upland range site, and windbreak suitability group 8.

CrF2—Crofton silt loam, 15 to 30 percent slopes, eroded. This steep, deep, somewhat excessively drained soil formed in loess. It is on uneven side slopes of uplands. Rills and gullies commonly form during rain if the vegetative cover is not sufficient to hold the soil in place. In most areas, the original surface layer has been removed by erosion, and the transition layer or the underlying material is at the surface. Areas range from 5 to 25 acres.

Typically, the surface layer is pale brown, very friable, calcareous silt loam about 6 inches thick. Beneath this is a transition layer of light yellowish brown, very friable, calcareous silt loam about 10 inches thick. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam. In places, the underlying material is noncalcareous, light gray, and mottled.

Included with this soil in mapping are small areas of Nora soils on similar parts of the landscape. Small areas of Steinauer soils, which formed in glacial till, are on lower parts of the landscape. Small areas of the sandy Thurman soils on similar landscapes are included. The included soils make up 5 to 25 percent of the map unit.

Permeability is moderate, and available water capacity is high. Moisture is readily released to plants. Organic matter content and natural fertility are low. Runoff is rapid. The rate of water intake is moderate.

Most of the acreage of this soil is in introduced grasses, native grasses, and trees. A few small areas, where the slope gradients are lowest, are in dryland crops.

This soil is not suited to any of the common cultivated crops because of its steepness and susceptibility to erosion.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet can compact the soil, thereby reducing the water intake rate and increasing the hazard of erosion. Nitrogen fertilization, rotation grazing, and proper stocking can help keep the grasses in good condition.

This soil is suited to rangeland use. The native grass on this steep soil is effective in controlling erosion. Overgrazing can reduce the protective cover of desirable grasses and thereby allow invasion of undesirable species and severe soil loss by water erosion. Proper grazing use, timely deferment of grazing, and a planned grazing system can maintain or improve the range condition.

This soil is not suited to trees and shrubs unless they are planted by hand or by other special practices.

This soil generally is not suited to septic tank absorption fields or sewage lagoons because of the steepness of slope. A suitable alternate site is needed. If

this soil is used as a site for dwellings and small commercial buildings, the structure should be designed to complement the slope, or the site should be graded. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Cutting and filling are generally needed to provide a suitable grade for roads and streets. Damage to roads and streets by frost action can be reduced by crowning the road by grading and by constructing adequate side ditches to help provide good surface drainage.

This soil is assigned to capability unit VIe-8 dryland, Limy Upland range site, and windbreak suitability group 10.

Ed—Eudora loam, sandy substratum, 0 to 2 percent slopes. This deep, moderately well drained soil is on high bottom lands of the Platte River Valley. It is rarely flooded. Areas range from 10 to 250 acres in size.

Typically, the surface layer is grayish brown very friable loam about 16 inches thick. The underlying material to a depth of 60 inches is pale brown, very friable very fine sandy loam in the upper part, light gray very fine sandy loam in the middle part, and light gray loamy fine sand in the lower part.

Included with this soil in mapping are small areas of Inavale soils on slightly higher parts of the landscape. These Inavale soils make up 2 to 5 percent of the map unit.

Permeability is moderate in this Eudora soil, and available water capacity is high. Moisture is readily released to plants. The organic matter content is moderately low. Natural fertility is high. Runoff is slow. The rate of water intake is moderate.

Nearly all the acreage of this unit is in cultivated crops. Most cultivated areas are irrigated by either the furrow or sprinkler method.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Row crops can be grown in consecutive years if a high level of management is used. Conservation of water is an important concern of management, especially during years of below average rainfall. Conservation tillage practices, which keep all or part of the crop residue on the surface, help conserve moisture and protect the soil from blowing.

Under irrigation, this soil is suited to corn and soybeans and to such close-growing crops as alfalfa. It has few limitations under irrigation. The areas are subject to rare flooding, but crop loss generally is slight. This soil is easily worked. Land leveling provides for even distribution of irrigation water and allows for uniform surface drainage. This soil is suited to sprinkler and gravity systems of irrigation.

This soil is suited to introduced grasses for pasture. Such species as reed canarygrass and creeping foxtail grow well. Overgrazing or grazing when the soil is wet can cause surface compaction and reduce the water intake rate. Proper stocking, rotation grazing, and restriction on grazing during wet periods help to keep the grasses in good condition. Fertilizing with nitrogen increases the growth and vigor of the grasses.

This soil is suited to rangeland. Overgrazing, untimely haying, and the use of improper mowing height reduce the protective cover and cause deterioration of the native plants. Proper grazing use, timely deferment of grazing or haying, and the use of a planned grazing system help maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks. Competition for moisture from grass and weeds is a concern in establishment and management of windbreaks on this soil. Weeds can be controlled by cultivating between the tree rows and by hand hoeing or careful use of herbicides within the rows. At times, rainfall is insufficient and newly planted trees need supplemental watering.

This soil readily absorbs the effluent from septic tank absorption fields, but it does not adequately filter the effluent. The poor filtering capacity may result in pollution of the ground water. The hazard of flooding should be considered in planning the use of this soil for sanitary facilities and building sites. Sewage lagoons need dikes for protection from flooding. They can be lined or sealed to prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Dwellings and buildings can be constructed on elevated, well compacted fill to prevent damage from flooding. Damage to roads and streets by frost action in the soil can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units I-1 dryland and I-5 irrigated, Silty Lowland range site, and windbreak suitability group 1.

Fm—Fillmore silt loam, 0 to 1 percent slopes. This deep, poorly drained soil occurs in broad, generally round or oblong, shallow depressions on loess uplands and stream terraces. It is occasionally ponded. Areas range from 5 to 20 acres in size.

Typically, the surface soil is friable silt loam about 11 inches thick. The upper part is dark grayish brown, and the lower part is gray. The subsurface layer is a leached horizon of light gray silt loam about 8 inches thick. The subsoil is dark gray silty clay about 33 inches thick. It is very firm in the upper part and firm in the lower part. The underlying material to a depth of 60 inches is grayish brown silty clay loam. In places, the light gray subsurface layer is not present or has been incorporated into the plow layer.

Included with this soil in mapping are small areas of the frequently ponded Fillmore soil in the lowest parts of the depressions. This included soil makes up 3 to 5 percent of the map unit.

Permeability is very slow in this Fillmore soil, and available water capacity is high. Moisture is released slowly to plants. This soil has a perched water table above the claypan subsoil. The water table ranges from about 6 inches above the soil surface to about 1 foot below the surface. Most of the surface water is removed by evaporation or transpiration. The content of organic matter is moderate, and natural fertility is medium. Runoff is very slow or ponded. The water intake rate is low. Shrink-swell potential is high.

Most of the acreage of this soil is farmed. Most cultivated areas are used for dryland crops, but a few are irrigated. A few small areas have been seeded to introduced grasses.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, and small grain. Soil wetness caused by very slow permeability and by ponding of runoff is the main limitation. Alfalfa may drown out unless drainage is provided. Droughtiness is a slight hazard during midsummer in most years. This soil needs artificial drainage for consistent growth of crops. Terracing and contour farming on higher lying soils help prevent ponding on this soil. Keeping crop residue on the surface keeps the surface layer friable. Crops generally cannot be planted early in spring, and they may need replanting if they are drowned out by the ponding resulting from rain.

Under irrigation, this soil is suited to corn and soybeans. Ponding commonly delays tillage and can damage small crops. This soil can be drained with V-shaped ditches where adequate outlets are available. Ponding can be controlled by using diversions or terraces to prevent excessive runoff from higher lying soils. This soil is suited to gravity and sprinkler irrigation systems. A tailwater recovery system can be installed to recycle excess irrigation water. Conservation tillage practices, which keep crop residue on the surface, help improve organic matter content and help control soil blowing.

This soil is suited to introduced grasses for pasture. Ponding is the main hazard. Grass species that are adapted to wet conditions, such as reed canarygrass, can be sown. Artificial drainage and diversion of runoff help prevent ponding. Grazing when the soil is wet compacts the soil and forms bogs or small mounds. Proper stocking and deferment of grazing help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Species that are tolerant of occasional ponding should be selected. Weeds can be controlled by cultivating between the tree rows and by careful use of selected herbicides or rototilling in the rows.

This soil generally is not suited to use as septic tank absorption fields because of ponding and very slow permeability. Sewage lagoons need to be diked for protection from ponding. This soil is not suited to dwellings and small commercial buildings because of ponding. Constructing roads on suitable, well compacted fill material above the ponding level and providing adequate side ditches and culverts help prevent damage to the roads from ponding. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIIw-2 dryland and IIIw-2 irrigated, Clayey Overflow range site, and windbreak suitability group 2W.

Fp—Fillmore silt loam, ponded, 0 to 1 percent slopes. This deep, very poorly drained soil is in shallow basins or depressions of the loess uplands and stream terraces. It is frequently ponded (fig. 9). Areas range from 10 to 40 acres in size.

Typically, the surface soil is friable silt loam about 18 inches thick. The upper part is gray; and the lower part, a leached horizon, is light gray. The subsoil is very firm silty clay about 28 inches thick. The upper part is dark gray, and the lower part is gray. The underlying material to a depth of 60 inches is grayish brown, mottled silty clay.

Included with this soil in mapping are small areas of the occasionally ponded Fillmore soil on slightly higher parts of the depressions. This included soil makes up 3 to 5 percent of the map unit.

Permeability of this Fillmore soil is very slow, and available water capacity is high. Areas of this soil do not have natural outlets for drainage; therefore, there is little or no runoff. Because of the very slow permeability of the subsoil, only a small amount of ponded water moves through the soil. Most of the ponded water is removed by evaporation and transpiration. The perched seasonal high water table ranges from a high of about 1 foot above the surface to a low of about 1 foot below the surface. The content of organic matter is moderate, and natural fertility is medium. The shrink-swell potential of the subsoil is high.

Most of the acreage of this soil is in introduced grasses for pasture or resting places for wildlife. A few areas are mowed for hay.

This soil is poorly suited to dryfarmed small grain. Ponding is the main hazard. Dugouts or drainage ditches can be installed to remove the excess water. In areas that do not have an artificial drainage system, the vegetation consists mainly of tall sedges, prairie cordgrass, reed canarygrass, and smartweed.

This soil is not suited to irrigated crops unless surface drainage has been installed. Drainage can be accomplished by installing a V-shaped ditch or by leveling the site.

This soil is suited to introduced grasses for pasture. The species selected must be able to withstand ponding.

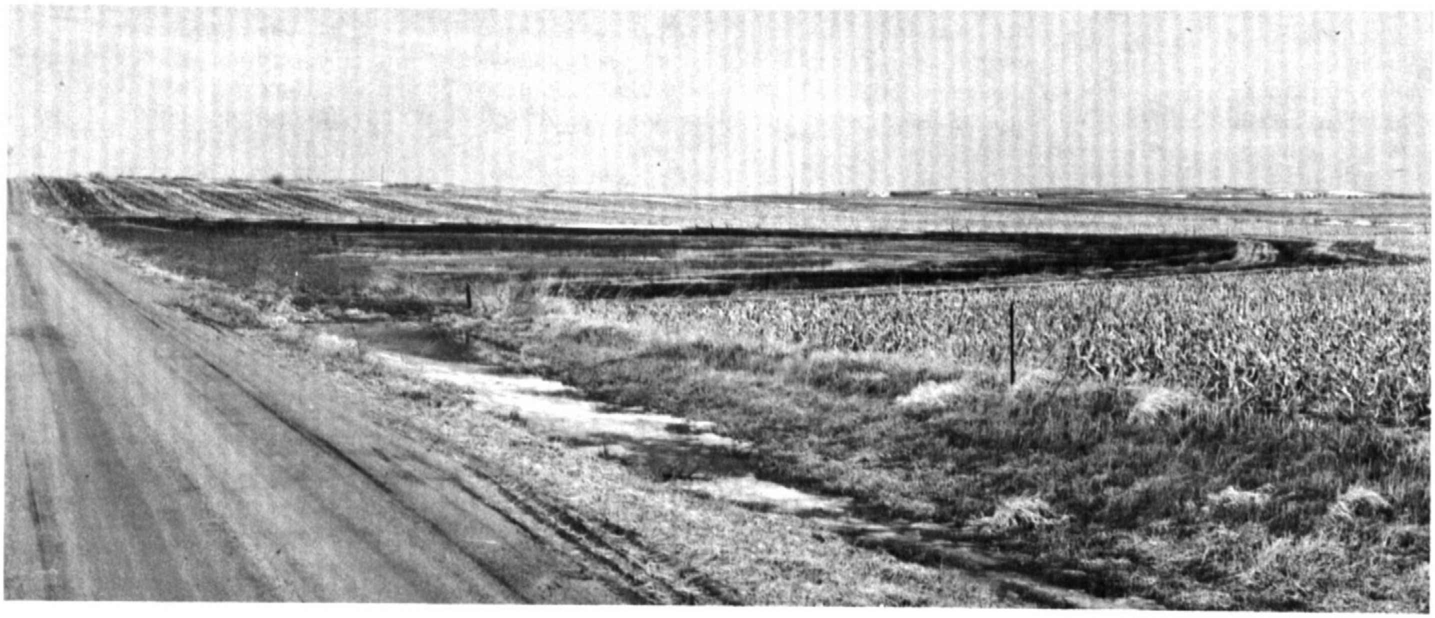

Figure 9.—Rainfall and snowmelt are ponded in this depressional area of Fillmore silt loam, ponded, 0 to 1 percent slopes.

Reed canarygrass is the most important of the suitable species. Overgrazing or grazing when the soil is wet causes compaction. Proper stocking and rotation grazing help keep the grasses in good condition.

This soil is not suited to use as rangeland because of the ponding, which occurs during much of the growing season.

This soil generally is not suited to plantings for windbreaks because of the frequent ponding. Limited plantings can be made for wildlife habitat if the species of trees and shrubs selected are tolerant of ponding and if special methods of planting are used to keep the small trees from drowning.

This soil generally is not suited to sanitary facilities or building sites because of frequent ponding. A suitable alternate site is needed. Roads need to be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Constructing roads on suitable, well compacted fill material above the ponding level and providing adequate side ditches and culverts help prevent damage to the roads from ponding and wetness. Mixing the base material for roads with additives such as hydrated lime helps prevent shrinking and swelling. Damage to roads by frost action can be reduced by providing good surface drainage and by using a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability unit IVw-2 dryland and windbreak suitability group 10. It is not assigned to a range site.

Gc—Gayville Variant silty clay loam, 0 to 2 percent slopes. This deep, moderately well drained soil formed in loess that capped stream terraces of Dry Creek and Maple Creek. This soil is affected by salinity and alkalinity. It is rarely flooded. Areas range from 15 to 400 acres in size.

Typically, the surface layer is gray very firm silty clay loam about 8 inches thick. The subsoil is about 35 inches thick and is affected by alkali. The upper part is grayish brown, very firm silty clay loam; the middle part is dark grayish brown and brown, very firm, slighty saline silty clay; and the lower part is pale brown, firm silty clay loam. The underlying material to a depth of 60 inches is pale brown silty clay loam. In places, the lower part of the subsoil is saline; and in places, the surface layer is saline-alkali.

Included with this soil in mapping are small areas of Belfore terrace soils on the same landscape and areas of Fillmore soils in small depressions. These included soils make up 10 to 15 percent of the map unit.

Permeability is very slow in this Gayville Variant soil, and available water capacity is high. Salinity is slight and the alkali content is moderate or strong. Moisture is released slowly to plants. The organic matter content is moderate, and natural fertility is medium. Runoff is slow. The shrink-swell potential is high. The rate of water intake is low.

Most of the acreage of this soil is cultivated. Most cultivated areas are used for dryland crops, but a few are irrigated. A few areas are in range.

Under dryland farming, this soil is poorly suited to corn, alfalfa, grain sorghum, and small grain. Crops tolerant of excessive soluble salts and strong alkali should be grown. Salinity, alkalinity, and droughtiness are the major concerns of management. Because of the salinity and alkalinity, poor soil structure, and ponding of rainwater in the low areas, cultivated crops commonly do poorly unless a high level of management is used. Adequate surface drainage is needed. Land leveling and V-shaped ditches can help improve surface drainage. Adding feedlot manure makes the soil more friable and increases the intake of water. Conservation tillage practices keep crop residue on the surface and thus help control soil blowing and surface crusting. The use of phosphate fertilizer commonly improves the vigor and growth of crops. Permanent reclamation of areas of this soil is difficult.

Under irrigation, this soil is poorly suited to corn and alfalfa. Poor surface drainage, excessive salinity, and alkalinity are the major limitations. Land leveling and shallow, V-shaped ditches can improve surface drainage. Feedlot manure and conservation tillage practices help improve tilth and intake of water. The rate at which water is applied needs to be controlled so as not to exceed the very low water intake rate of the soil. The use of phosphate fertilizer commonly improves the vigor and growth of plants. Gypsum and sulfur can be tried on an experimental basis to help neutralize the excess sodium.

This soil is suited to introduced grasses for pasture. It is best suited to species that are tolerant of soluble salts and alkali, such as tall wheatgrass, western wheatgrass, and switchgrass. Grazing when the soil is wet causes surface compaction and reduces the water intake rate. Proper stocking, rotation grazing, and application of nitrogen and phosphate fertilizers help keep the grasses in good condition.

This soil is suited to native grasses for range. Overgrazing or untimely haying can reduce the protective cover and allow the invasion of undesirable species. Grazing when the soil is wet can cause surface compaction. Proper grazing use, timely deferment of grazing, restriction on grazing during wet periods, and the use of a planned grazing system help keep the range in good condition.

This soil is suited to trees and shrubs for windbreaks. Species that are tolerant of the salinity and alkalinity should be selected. At times, rainfall is insufficient, and the trees and shrubs have to be watered. Undesirable weeds and grasses can be controlled by cultivating between the tree rows and by hand hoeing or rototilling in the rows.

In planning the use of this soil as a site for sanitary facilities and buildings the hazard of rare flooding should be considered. Sewage lagoons need to be diked for protection from the flooding. This soil generally is not suited to use as septic tank absorption fields because of the very slow permeability. Dwellings and buildings can be constructed on well compacted fill material as protection from flooding. Foundations need to be strengthened and backfilled with coarse material to prevent damage by shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Mixing the base material for roads and streets with additives such as hydrated lime helps prevent shrinking and swelling.

This soil is assigned to capability units IVs-1 dryland and IVs-3 irrigated, Saline Lowland range site, and windbreak suitability group 9N.

GvD2—Geary Variant silty clay loam, 6 to 11 percent slopes, eroded. This deep, well drained, strongly sloping soil formed in brownish loess. It generally is on side slopes on loess uplands. Areas range from 5 to 30 acres in size.

Typically, the surface layer is grayish brown, friable silty clay loam about 6 inches thick. The subsoil is friable silty clay loam about 33 inches thick. The upper part is yellowish brown, the middle part is brown, and the lower part is light brown. The underlying material to a depth of 60 inches is light brown silty clay loam.

Included with this soil in mapping are small areas of Steinauer soils, which may be intermixed with or lower than the Geary Variant soil on the landscape. Also included are small areas of the silty Crofton, Moody, and Nora soils on side slopes, generally above the Geary Variant soil. The included soils make up 10 to 15 percent of the map unit.

Permeability is moderately slow in this Geary Variant soil, and available water capacity is high. Moisture is readily released to plants. Organic matter content is low. Natural fertility is medium. Runoff is medium. Shrink-swell potential of this soil is moderate. The rate of water intake is low.

About one-half the acreage of this soil is used for dryland crops. The rest is in introduced grasses.

Under dryland farming, this soil is poorly suited to corn, grain sorghum, small grain, and legumes. Water erosion is the main hazard where the surface is not adequately protected by close-growing crops or crop residue. Conservation tillage practices, such as disking and chiseling, leave crop residue on the surface and help prevent erosion by water as well as conserve moisture and increase the supply of organic matter. Terraces, grassed waterways, and field borders can also be used to help control erosion and conserve water.

Under irrigation, this soil is poorly suited to row crops. Water erosion is the most serious hazard. Efficient management of irrigation water is a concern. Conservation tillage practices, such as chiseling, disking, and no-tillage, can be used to help control erosion. This

strongly sloping soil is best suited to sprinkler irrigation systems because the rate at which water is applied can be adjusted to reduce the runoff rate.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet causes compaction and reduces the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Seedlings generally survive and grow well if competing vegetation is controlled or removed. This can be accomplished by good site preparation and by timely cultivation or application of appropriate herbicides. Erosion can be controlled by planting a cover crop between the rows of trees or by terracing and planting the trees on the contour. Limited rainfall is the principal limitation to the planting of trees. Irrigation may be needed for the seedlings.

The use of this soil as septic tank absorption fields is limited by the moderately slow permeability, but this limitation can generally be overcome by increasing the size of the absorption field. Sewage lagoons can be constructed on this soil, but grading is required to modify the slope and shape the lagoon. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. If this soil is used as a site for dwellings and small commercial buildings, the structure should be designed to complement the slope, or the site should be graded. Local roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IVe-8 dryland and IVe-3 irrigated, Silty range site, and windbreak suitability group 3.

GvF2—Geary Variant silty clay loam, 11 to 30 percent slopes, eroded. This deep, well drained soil is moderately steep and steep. It is on side slopes on loess uplands. Areas range from 5 to 20 acres in size.

Typically, the surface layer is brown, friable silty clay loam 6 inches thick. The underlying material to a depth of 60 inches is silty clay loam. It is yellowish brown in the upper part and light yellowish brown in the lower part. In places, the soil material below a depth of 30 inches is sandy clay loam or clay loam.

Included with this soil in mapping are small areas of Steinauer soils, generally below the Geary Variant soil on the landscape. Also included are small areas of the silty Nora and Crofton soils, generally above the Geary Variant soil. The included soils make up 5 to 15 percent of the map unit.

Permeability is moderately slow in this Geary Variant soil, and available water capacity is high. Moisture is readily released to plants. Organic matter content is low, and natural fertility is medium. Runoff is rapid. Shrink-swell potential of this soil is moderate.

Most of the acreage of this soil is in introduced or native grasses. A few small areas are in alfalfa or cultivated crops.

This soil generally is not suited to the common cultivated crops, either dryland or irrigated. The hazard of erosion is too severe, and the slope is too steep for successful cultivation.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet causes compaction and reduces the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to native grasses for rangeland. Overgrazing, untimely haying, and use of improper mowing height reduce the protective cover and cause deterioration of the native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks in areas where the general slope does not exceed 15 percent. Good site preparation is needed. Herbicides can be used to control weeds in the row. Erosion can be controlled by planting a cover crop between the rows of trees and by planting trees on the contour. Limited rainfall is the principal limitation, and supplemental irrigation of the young trees may be needed.

This soil is generally not suitable for septic tank absorption fields and sewage lagoons because of the steepness of slope. A suitable alternate site is needed. If this soil is used as a site for dwellings and small commercial buildings, the structure should be designed to complement the slope, or the site should be graded. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Cutting and filling are generally needed to provide a suitable grade for roads and streets. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability unit VIe-8 dryland, Silty range site, and windbreak suitability group 10.

Ha—Hall silty clay loam, sandy substratum, 0 to 1 percent slopes. This deep, well drained, nearly level soil is on stream terraces of the Platte River Valley. It formed

in a mixture of loess, colluvium, and alluvium that overlies loamy and sandy alluvium. This map unit is a single area of about 2,100 acres.

Typically, the surface layer is friable silty clay loam about 16 inches thick. It is dark gray in the upper part and dark grayish brown in the lower part. The subsoil is friable silty clay loam about 22 inches thick. The upper part is dark grayish brown, the middle part is dark brown, and the lower part is brown. The underlying material to a depth of 60 inches is yellowish brown. It is fine sandy loam in the upper part and loamy sand in the lower part.

Included with this soil in mapping are small areas where the surface layer is sandy loam or loamy sand. These areas are a result of land leveling. They make up 3 to 5 percent of the map unit.

Permeability is moderate in the upper part of this Hall soil and rapid in the lower part. The available water capacity is moderate. Moisture is readily released to plants. The organic matter content is moderate, and natural fertility is high. Runoff is slow. The shrink-swell potential is moderate, and the rate of water intake is low.

Most of the acreage of this soil is irrigated cropland. There are a few small areas of introduced grasses, generally near farmsteads.

Under dryland farming, this soil is suited to corn, soybeans, sorghum, small grain, and alfalfa. Droughtiness late in summer, caused by the sandy substratum, is the main limitation. Conservation tillage practices, which leave all or part of the crop residue on the surface, help conserve moisture. Returning crop residue to the soil and the use of green manure crops and feedlot manure help maintain and improve the organic matter content, fertility, and water infiltration rate.

Under irrigation, this soil is suited to corn, soybeans, and alfalfa. Efficient management of irrigation water is a concern because of the low rate of water intake. The application rate can be adjusted for a sprinkler system so as not to exceed the intake rate. Leveling and an irrigation tailwater recovery system can increase the efficiency of gravity irrigation. Applying feedlot manure and keeping crop residue on the surface are good ways to improve the infiltration of water.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa. Overgrazing or grazing when the soil is wet causes compaction and reduces the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Seedlings generally survive and grow well if competing vegetation is controlled or removed. This can be accomplished by good site preparation and by timely cultivation or application of selected herbicides. At times, rainfall is insufficient and young trees need irrigation.

The soil readily absorbs effluent from septic tanks but it does not adequately filter the effluent. The poor filtering capacity may result in pollution of ground water. The moderate permeability of this soil is an additional limitation for septic tank absorption fields, but this limitation generally can be overcome by increasing the size of the absorption field. Sewage lagoons need to be lined or sealed to prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance.

This soil is assigned to capability units I-1 dryland and I-3 irrigated, Silty range site, and windbreak suitability group 1.

Hb—Hobbs silt loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil formed in alluvium on flood plains of narrow upland drainageways. It is occasionally flooded. Areas range from 5 to 100 acres in size.

Typically, the surface layer is grayish brown, very friable silt loam about 7 inches thick. The underlying material to a depth of 60 inches is thinly stratified silt loam. It is grayish brown in the upper part and dark gray in the lower part.

Included with this soil in mapping are small areas of the poorly drained Kezan soils and the somewhat poorly drained Colo soils. These included soils are slightly lower on the landscape than the Hobbs soil. They make up 3 to 8 percent of the map unit.

Permeability is moderate in this Hobbs soil, and available water capacity is high. Moisture is released readily to plants. The organic matter content is moderate, and natural fertility is high. Runoff is slow. The water intake rate is moderate.

Most of the acreage of this soil is farmed. Many cultivated areas are irrigated, but some are used for dryland farming. A few small areas are in introduced or native grasses. These areas are generally near channels and bends of the creeks and are inaccessible.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Conservation of water is a management concern during dry years. Conservation tillage practices, which keep all or most of the crop residue on the surface, help conserve moisture for use by crops and build up the supply of organic matter.

Under irrigation, this soil is suited to corn, soybeans, and alfalfa. Floodwaters generally recede within a few hours and crops are seldom severely damaged. Surface drain with V-shaped ditches can help remove floodwaters if an outlet is available. Wetness in spring commonly delays early planting. This soil is suited to sprinkler and gravity systems.

This soil is suited to introduced grasses for pasture. Pastures are generally smooth brome or a mixture of

grasses and legumes. Overgrazing or grazing when the soil is wet can cause soil compaction and reduce the water intake rate. Proper stocking, deferred grazing, and nitrogen fertilization help keep the grasses in good condition.

This soil is suited to rangeland. Overgrazing and deposition of silt reduce the vegetative cover and allow invasion by undesirable plant species. Proper grazing use, deferment of grazing, and the use of a planned grazing system help maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks. Competition from weeds for moisture is a concern of management. Cultivating between the tree rows and hand hoeing or careful use of herbicides in the rows help control weeds. If necessary, a V-shaped ditch can be installed to help remove floodwaters.

This soil generally is not suited to septic tank absorption fields, sewage lagoons, or buildings because of the hazard of flooding. A suitable alternate site is needed. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed drainage.

This soil is assigned to capability units IIw-3 dryland and IIw-6 irrigated, Silty Overflow range site, and windbreak suitability group 1.

Hf—Hobbs silt loam, channeled. This soil is on bottom lands of the larger creeks and their tributaries. Deeply cut stream channels meander across the areas. The areas are frequently flooded. They are long and narrow and range from 10 to 80 acres in size.

Typically, this soil has a surface layer of very dark gray, friable silt loam about 8 inches thick. The underlying material to a depth of 60 inches is stratified silt loam. The upper part is dark gray and grayish brown, and the lower part is light brownish gray.

Included with this soil in mapping are small areas of Colo and Kezan soils. The somewhat poorly drained Colo soils and the poorly drained Kezan soils are on slightly lower parts of the landscape. They make up 10 to 15 percent of this map unit.

Permeability is moderate in this Hobbs soil, and the available water capacity is high. The seasonal high water table is below a depth of 6 feet. Moisture is released readily to plants. The organic matter content is moderate, and natural fertility is high. Runoff is medium.

Most of the acreage of this unit is in trees and native grasses. It is used for grazing and as habitat for wildlife.

This soil is not suited to farming. The areas are flooded too frequently, and many are not accessible. Streambank erosion can occur during high streamflow.

Where accessible, this soil is suited to introduced grasses for pasture. It is used for grazing mainly during dry periods. Proper stocking helps keep the grasses in good condition. Use should be restricted during the wettest periods.

This soil is suited to rangeland use. Overgrazing and deposition of silt, however, reduce the protective cover and cause deterioration of the natural vegetation. When the soil is wet, overgrazing can compact the surface, making it difficult to graze or harvest for hay. Proper grazing use, timely deferment of grazing or haying, and restriction on grazing during wet periods help keep the native plants and the soil in good condition.

This soil generally is not suited to plantings for windbreaks because of the frequent flooding and general inaccessibility of areas. In some areas it can be used for wildlife plantings if trees and shrubs that can withstand flooding are selected and if hand planting or other special practices are used.

This soil is not suited to use as a site for sanitary facilities or buildings because of the hazard of frequent flooding. A suitable alternate site is needed. Bridges or culverts are needed where roads cross areas of this soil. Roads need to be constructed on suitable, well compacted fill material above flood level and provided with adequate side ditches. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability unit VIw-7, Silty Overflow range site, and windbreak suitability group 10.

InB—Inavale loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, somewhat excessively drained soil is on bottom lands of the Platte River Valley. It is occasionally flooded. Areas range from 15 to 200 acres in size.

Typically, the surface layer is dark grayish brown, loose loamy fine sand about 8 inches thick. Beneath this is a transition layer of pale brown, loose loamy fine sand about 5 inches thick. The underlying material to a depth of 60 inches is very pale brown loamy fine sand and fine sand that is stratified with thin lenses of loamy sediment. Some areas have strata of dark gray very fine sandy loam 6 to 12 inches thick above a depth of 40 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Alda fine sandy loam, Boel loam, and Ord fine sandy loam, all on slightly lower parts of the landscape. These included soils make up 3 to 8 percent of this map unit.

This Inavale soil has rapid permeability and low available water capacity. Moisture is released readily to plants. The organic matter content and natural fertility are low. Tilth is good. Runoff is slow. The rate of water intake is very high.

Most of the acreage of this soil is used for cultivated crops. The rest is in native or introduced grasses used for grazing.

Under dryland farming, this soil is poorly suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Because of the low available water capacity, this soil is droughty, especially during summer. Conservation tillage practices, such as disking and no-tillage, keep crop residue on the surface and thus help conserve moisture for use by crops, build up the supply of organic matter, and reduce soil blowing. Close-growing crops are more dependable than row crops because they make most of their growth in spring, when rainfall is greatest.

Under irrigation, this soil is suited to corn and grain sorghum, but it is better suited to close-growing crops such as alfalfa and small grain. The hazard of soil blowing and the low moisture retention capacity of the soil are the main concerns of management. This soil is suited only to sprinkler irrigation. The rate at which water is applied can be high because the soil absorbs the water rapidly. The water should be applied frequently because of the low moisture retention capacity of the soil. Conservation tillage practices are needed to keep crop residue on the surface and thereby help reduce soil blowing.

This soil is suited to introduced grasses for pasture. Pastures usually consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Rotation grazing, proper stocking, and fertilization with nitrogen help keep the grasses in good condition.

The soil is suited to rangeland use. Overgrazing, untimely haying, and use of improper mowing height reduce the protective cover and cause deterioration of the grasses. Timely deferment of grazing or haying and use of a planned grazing system help maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks. It is best suited to those species tolerant of coarse textured, somewhat droughty soils. The lack of available moisture and soil blowing are the principal hazards. Soil blowing can be prevented by maintaining strips of sod or a cover crop between the rows. At times, rainfall is not sufficient and young trees may need watering.

This soil generally is not suited to use as septic tank absorption fields or building sites because of flooding. A suitable alternate site is needed. Sewage lagoons need to be sealed or lined to prevent seepage, and they can be diked for protection from flooding. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding.

This soil is assigned to capability units IVe-5 dryland and IIIe-11 irrigated, Sandy Lowland range site, and windbreak suitability group 5.

InD—Inavale loamy fine sand, 3 to 9 percent slopes. This deep, gently sloping and strongly sloping, somewhat excessively drained soil is on bottom lands of the Platte River Valley. It is rarely flooded. Areas range from 5 to 200 acres in size.

Typically, the surface layer is loose, dark grayish brown loamy fine sand about 7 inches thick. A transition layer of light brownish gray, loose loamy fine sand about 8 inches thick is beneath the surface layer. The underlying material to a depth of 60 inches is light gray fine sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Alda and Ord soils on slightly lower parts of the landscape. These included soils make up 5 to 8 percent of this map unit.

This Inavale soil has rapid permeability and low available water capacity. Moisture is released readily to plants. The organic matter content and natural fertility are low. Tilth is fair. Runoff is slow. The water intake rate is very high.

Most of the acreage of this unit is in native grasses used for grazing or haying. A few small areas are farmed, generally under sprinkler irrigation.

This soil is not suited to dryland farming because of droughtiness and slope.

Under irrigation, this soil is poorly suited to corn and alfalfa. Soil blowing and the low moisture retention capacity are the main concerns of management. This soil is best suited to sprinkler irrigation. The rate at which water is applied should be high because the soil absorbs the water readily. Applications of water should be frequent because of the low moisture retention capacity of the soil. Conservation tillage practices, which keep crop residue on the surface, help reduce soil blowing and loss of soil moisture.

This soil is suited to introduced grasses for pasture, generally smooth brome. Overgrazing can leave the site susceptible to soil blowing. Proper stocking and rotation grazing help keep the grasses in good condition. Fertilizing with nitrogen increases production of forage.

This soil is suited to rangeland use. Overgrazing, untimely haying, and use of improper mowing height reduce the protective plant cover and thereby leave the site susceptible to soil blowing and invasion by weedy plants and grasses. Deferred grazing and a planned grazing and haying system can be used to maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks. It is suited only to those species tolerant of coarse textured, somewhat droughty soils. The potential for plant survival and growth is fair. The low amount of available moisture and soil blowing are the principal hazards. Soil blowing can be prevented by maintaining strips of sod or a cover crop between the tree rows. At

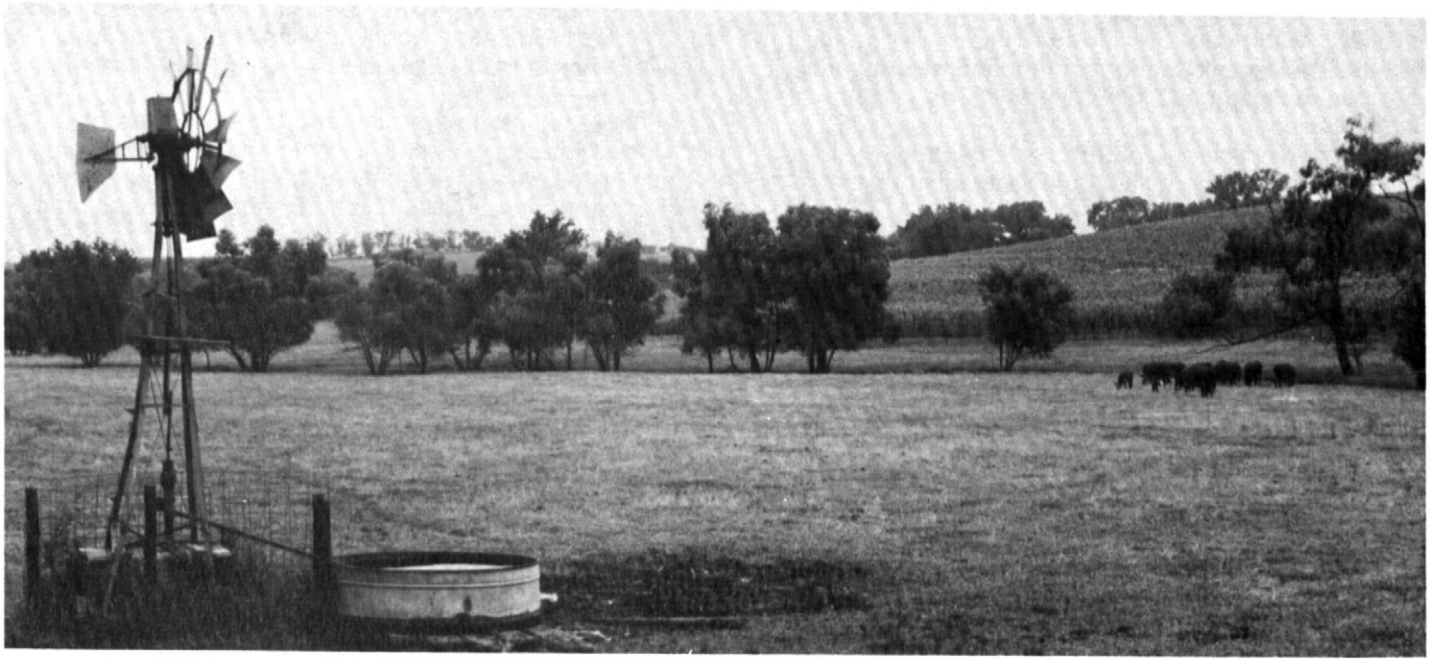

Figure 10.—Typical landscape of Kezan silt loam, 0 to 2 percent slopes, a poorly drained soil in narrow upland drainageways.

times, rainfall is not sufficient, and young trees need watering. Weeds and undesirable grasses near the trees can be hoed by hand.

The hazard of flooding and the rapid permeability should be considered in planning the use of this soil as a site for sanitary facilities, buildings, and roads. This soil readily absorbs the effluent from septic tank absorption fields, but it does not adequately filter the effluent. The poor filtering capacity may result in pollution of ground water. Sewage lagoons need to be lined or sealed to prevent seepage. Dikes for protecting lagoons against flooding are difficult to maintain in this loose sand. Grading of the area may be required to modify the slope and shape the lagoon. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Dwellings and small commercial buildings can be constructed on elevated, well compacted fill material for protection from flooding. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding.

This soil is assigned to capability units VIe-5 dryland and IVe-12 irrigated, Sandy Lowland range site, and windbreak suitability group 7.

Kz—Kezan silt loam, 0 to 2 percent slopes. This deep, nearly level, poorly drained soil is on bottom lands of narrow upland drainageways (fig. 10). This soil is frequently flooded. Areas range from 5 to 100 acres in size.

Typically, the surface layer is stratified grayish brown and dark grayish brown, friable silt loam about 10 inches thick. The underlying material to a depth of 60 inches is stratified light brownish gray and grayish brown, mottled silt loam.

Included with this soil in mapping are small areas of Hobbs soils on slightly higher positions on the landscape. Also included are small areas of soils that have a water table at or near the surface. These soils are on slightly lower positions on the landscape.

Permeability is moderate in this Kezan soil, and available water capacity is high. Moisture is readily released to plants. The seasonal high water table ranges in depth from about 1 foot in most wet years to about 3 feet in most dry years. The organic matter content is moderate, and natural fertility is medium. Tilth is good. Runoff is slow. The rate of water intake is moderate.

Most of the acreage of this soil is in introduced or native grasses. The areas are generally used for grazing, but some are used as habitat by wetland wildlife. A few small areas are farmed.

This soil is poorly suited to dryland farming and is not suited to irrigation because of the wetness and flooding. Grain sorghum is the best dryfarmed crop. The use of V-shaped ditches and land leveling helps improve drainage. This soil is slow to warm up in the spring; therefore, tillage commonly is delayed.

This soil is poorly suited to introduced grasses for pasture because of its wetness. Reed canarygrass and

creeping foxtail are the most suitable species. Artificial drainage with V-shaped ditches or perforated tile is necessary for growing the more common introduced grasses.

This soil is suited to rangeland use. Overgrazing, however, reduces the protective cover. Proper grazing and a planned grazing system help improve the range condition. Grazing should be restricted during wet periods to prevent formation of small mounds or bogs that make further grazing or haying difficult.

This soil is suited to trees and shrubs for windbreaks. Only species tolerant of wetness and flooding should be planted. The growth of weeds and grasses can be controlled by cultivating between the rows and by hand hoeing or rototilling in the rows. If necessary, a V-shaped ditch can be installed to improve drainage.

This soil generally is not suited to septic tank absorption fields, sewage lagoons, or buildings because of flooding. A suitable alternate site is needed.

Bridges and culverts are common on roads that cross areas of this soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding. Damage to roads by frost action can be reduced by providing good surface drainage and by using a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability unit IVw-4 dryland, Subirrigated range site, and windbreak suitability group 2D.

Lc—Lawet silt loam, 0 to 1 percent slopes. This deep, poorly drained soil formed in alluvium on bottom lands of the Platte River Valley. It is rarely flooded. Areas range from 15 to 500 acres in size.

Typically, the surface layer is calcareous, very friable silt loam about 24 inches thick. It is dark gray in the upper part and gray in the lower part. The subsoil is calcareous, gray silty clay loam about 6 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silty clay loam in the upper part, white silt loam in the middle part, and white fine sand in the lower part. In places, the surface layer is dark colored to a depth of 25 inches.

Included with this soil in mapping are small areas of Shell soils on higher parts of the landscape and Zook soils on slightly lower parts of the landscape. These included soils make up 3 to 5 percent of this map unit.

Permeability is moderately slow in this Lawet soil. Available water capacity is high. Moisture is readily released to plants. The seasonal high water table is at a depth of about 1 foot in most wet years and a depth of about 2 feet in most dry years. The organic matter content is high, and natural fertility is medium. Runoff is slow. The shrink-swell potential of the material in most parts of the profile is moderate. Tilth is good. The rate of water intake is moderately low.

Most of the acreage of this soil is farmed, and the crops are irrigated by either a center-pivot sprinkler system or a gravity system. A few areas are dryfarmed.

Under dryland farming, this soil is suited to corn and small grain. It is not so well suited to alfalfa because of wetness. In spring the soil warms up slowly and tillage operations commonly are delayed. In some years the high water table limits production of alfalfa. The high calcium content in this soil also limits production of alfalfa and soybeans. The use of V-shaped ditches or perforated tile helps improve drainage by lowering the water table.

Under irrigation, this soil is suited to corn and to close-growing crops such as alfalfa. Wetness, caused mainly by the seasonal high water table, is the main limitation. Tillage commonly is delayed early in spring because of wetness. The use of V-shaped ditches or perforated tile helps to improve drainage by lowering the water table. This soil is suited to gravity and sprinkler systems. If a gravity system is used, land leveling generally is needed for even distribution of the water and for uniform surface drainage. In places, locating suitable outlets is a problem in planning a drainage system.

This soil is suited to introduced grasses for pasture. Such species as reed canarygrass and creeping foxtail grow well. Overgrazing or grazing when the soil is wet can cause surface compaction and reduce the water intake rate. Proper stocking, rotation grazing, and restriction on grazing during wet periods help keep the grasses in good condition. Fertilizing with nitrogen and phosphorus increases the growth and vigor of the grasses.

This soil is suited to trees and shrubs for windbreaks, but only to those species that are tolerant of a high water table. Establishment of trees may be a problem in wet years. The grassy vegetation is abundant and persistent in competing with small trees. It can be controlled by cultivating between the rows and by rototilling, hand hoeing, or careful use of selected herbicides in the rows.

Because of flooding and wetness, this soil generally is not suited to use a site for sanitary facilities or buildings. A suitable alternate site is needed. The walls or sides of shallow excavations can be shored to prevent sloughing or caving. Damage to roads by frost action can be reduced by providing good surface drainage and by using a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding and wetness.

This soil is assigned to capability units IVw-4 dryland and IVw-4 irrigated, Subirrigated range site, and windbreak suitability group 2S.

Ld—Lawet silty clay loam, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is on bottom lands of the Platte River Valley. Flooding is rare. Areas range from 15 to 300 acres in size.

Typically, the surface layer is dark gray and gray, friable silty clay loam about 24 inches thick. The subsoil is gray, firm clay loam about 8 inches thick. The underlying material to a depth of 60 inches is light gray clay loam in the upper part, light brownish gray sandy clay loam in the middle part, and light gray fine sand in the lower part. In places, the surface layer is dark colored to a depth of only 10 or 12 inches; and in other places, it is dark colored to a depth of 30 inches.

Included with this soil in mapping are areas of Lawet silt loam. Also included are small areas of alkali soils on similar landscapes. The included soils make up 2 to 5 percent of this map unit.

Permeability is moderately slow in this Lawet soil, and available water capacity is high. Moisture is readily released to plants. The seasonal high water table is at a depth of about 1 foot early in most wet years and at a depth of about 2 feet in most dry years. The content of organic matter is high, and natural fertility is medium. Runoff is slow. The shrink-swell potential of most of this soil is moderate. Tilth is fair. The rate of water intake is moderately low.

Most of the acreage of this soil is farmed, and the crops are irrigated by either a center-pivot sprinkler system or by a gravity system. A few areas are dryfarmed. A few areas are in introduced or native grasses.

Under dryland farming, this soil is suited to corn, grain sorghum, and small grain. Because of wetness, it is not so well suited to alfalfa as to the other crops. Because this soil warms up slowly in spring, tillage operations commonly are delayed. During wet years the high water table may limit production of alfalfa. The high calcium content in this soil limits growth of soybeans and alfalfa. V-shaped ditches or perforated tile can be installed to lower the water table and thus to improve drainage.

Under irrigation, this soil is suited to corn and to such close-growing crops as alfalfa. Wetness and the high content of calcium carbonate are the main limitations. Tillage commonly is delayed early in spring because of wetness. V-shaped ditches or perforated tile can be used to lower the water table and thus to improve drainage. This soil is suited to gravity or sprinkler systems. If a gravity system is used, land leveling generally is needed for even distribution of water and for uniform surface drainage. In places, suitable drainage outlets are not available.

This soil is suited to introduced grasses for pasture. Such species as reed canarygrass or creeping foxtail grow well. Overgrazing or grazing when the soil is wet can cause surface compaction and reduce the water intake rate. Proper stocking, rotation grazing, and restriction on grazing during wet periods help keep the grasses in good condition. Fertilizing with nitrogen and phosphorus increases the growth and vigor of the grasses.

This soil is suited to native grasses for range. Overgrazing or grazing when the surface is wet, however, can compact the surface and make it uneven, thereby impeding haying operations. Overgrazing, untimely haying, and use of improper mowing height can reduce the protective plant cover and allow the invasion of less palatable grasses. Proper grazing use, deferred grazing, and a planned grazing and haying system can be used to maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks, but only to those that are tolerant of a high water table. The herbaceous vegetation is abundant and persistent but can be controlled with herbicides. Weeds and grasses can be controlled by cultivating between the rows and by rototilling or hand hoeing in the rows. In summer, clean-tilled areas may crack when dry and require light cultivation. If necessary, a V-shaped ditch can be installed to lower the water table.

Because of wetness and flooding, this soil generally is not suited to use as a site for sanitary facilities or buildings. A suitable alternate site is needed. The walls or sides of shallow excavations can be shored to prevent sloughing or caving. Damage to roads by frost action can be reduced by providing good surface drainage and by using a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage. The use of suitable, well compacted fill material and adequate side ditches and culverts helps protect roads from wetness.

This soil is assigned to capability units IVw-4 dryland and IVw-3 irrigated, Subirrigated range site, and windbreak suitability group 2S.

Lu—Luton silty clay, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is on bottom lands of the Platte River Valley. In places, it is in old abandoned river channels on the lowest part of the landscape. This soil is occasionally flooded. Areas range from 10 to 500 acres in size.

Typically, the surface layer is dark gray, very firm silty clay about 15 inches thick. The subsoil is dark gray, very firm, calcareous silty clay about 21 inches thick. The underlying material to a depth of 60 inches is calcareous silty clay. It is gray in the upper part and light gray in the lower part.

Included with this soil in mapping are small areas of the saline-alkali Napa soils on a similar position on the landscape and the noncalcareous Zook soils on a similar or only slightly higher position on the landscape. These included soils make up 5 to 8 percent of the map unit.

Permeability is very slow in this Luton soil, and available water capacity is moderate. Moisture is

released slowly to plants. This soil has a seasonal high water table that ranges from a depth of about 1 foot in most wet years to a depth of 3 feet in most dry years. The organic matter content is moderate, and the natural fertility is medium. Runoff is very slow. Tilth is poor. This soil has high shrink-swell potential and low strength. The rate of water intake is very low.

Most of the acreage of this soil is used for farming. Dryland and irrigated crops are grown. A few areas are in introduced grasses.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Both the wetness and the very firm consistence of the soil influence use and management. Surface water stands in low areas for several days after rains and delays tillage operations. Upon drying, the soil cracks and thus exposes plant roots. Land leveling and the use of ditches can improve drainage. Most areas of this soil are plowed late in fall. In winter, soil blowing is a hazard if snow cover or other kinds of protection are inadequate. Soil workability is generally poor because the soil is very sticky when wet and very hard when dry. The soil should be tilled only when the surface layer is moist, not too wet or too dry.

Under irrigation, this soil is suited to such row crops as corn and soybeans and to such close-growing crops as alfalfa. Wetness caused by the perched water table is the main limitation. The soil is difficult to till because it is very hard and cloddy when dry and very firm when wet. It should be tilled only when it is moist, not too wet or too dry. If this soil is to be irrigated by a gravity system, it generally needs a small amount of leveling. A tailwater recovery system can be installed at the lower end of fields to recycle runoff of irrigation water. This soil is suited to irrigation by sprinklers, but the low intake rate of the soil requires a low application rate. Deep rooted legumes, such as alfalfa, tend to open the soil for more effective penetration of moisture.

This soil is suited to introduced grasses for pasture. Such grasses as reed canarygrass or creeping foxtail grow well. Overgrazing or grazing when the soil is wet causes surface compaction and reduces the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to rangeland use. Overgrazing, untimely haying, and use of improper mowing height can reduce the protective plant cover and allow the invasion of less palatable grasses. Proper grazing use, deferred grazing, and a planned grazing and haying system can be used to maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks. The species selected should be tolerant of the moderately high water table. Competition from grass and weeds for moisture is a concern of management. The growth of undesirable plants can be controlled by cultivating between the tree rows and by rototilling or hand hoeing in the rows. In dry weather, shallow cultivation may be needed to close cracks in the soil in order to protect the plant roots.

This soil generally is not suited to use as septic tank absorption fields because of flooding, very slow permeability, and wetness. A suitable alternate site is needed. Sewage lagoons need to be diked for protection from flooding. They also need to be constructed on fill material to raise the bottom of the lagoon above the seasonal high water table.

The use of this soil as a site for local roads and streets is limited by the low strength and shrink-swell potential of the soil and by the hazard of flooding. The pavement and subbase of roads and streets should be thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Mixing the base material with additives such as hydrated lime helps prevent shrinking and swelling. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding.

This soil is assigned to capability units III-w1 dryland and IIIw-1 irrigated, Clayey Overflow range site, and windbreak suitability group 2W.

Mo—Moody silty clay loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on loess uplands and high stream terraces. Areas range from 10 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 18 inches thick. The subsoil is friable silty clay loam about 24 inches thick. It is grayish brown in the upper part and pale brown in the middle part. The underlying material to a depth of 60 inches is pale brown silty clay loam.

Included in mapping are small areas of the more clayey Belfore soils on similar positions on the landscape and the poorly drained Fillmore soils in shallow depressions. The included soils make up 3 to 5 percent of this map unit.

Permeability is moderately slow in this Moody soil, and available water capacity is high. Moisture is readily released to plants. The content of organic matter is moderate, and natural fertility is high. Runoff is slow. Tilth is good. The shrink-swell potential is moderate. The rate of water intake is low.

Most of the acreage of this soil is farmed. Most cultivated areas are used for dryland farming, but some are irrigated. A few small areas, generally near farmsteads, are in introduced grasses.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Conservation of water is an important concern of management. Conservation tillage—no-tillage, for example—keeps crop residue on the surface and thereby helps conserve moisture for use by crops and decrease soil blowing. Lime is needed to overcome acidity if alfalfa is to be grown.

Under irrigation, this soil is suited to corn, soybeans, and alfalfa. This soil tends to form clods if tilled when

wet. Gravity and sprinkler irrigation systems are suitable for row crops. This soil is particularly well suited to center-pivot irrigation. If a gravity system is used, land leveling and a tailwater recovery system can increase the efficiency of water use. The rate at which water is applied should be adjusted so it does not exceed the intake rate of this moderately fine textured soil.

This soil is suited to introduced grasses for pasture. Pastures commonly consist of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet can cause surface compaction and reduce the water intake rate. Rotation grazing, proper stocking, and the use of nitrogen fertilizer help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, properly planted on a well prepared site, can survive and grow well. Care after planting is needed if they are to survive. Cultivating between the tree rows and hand hoeing or careful use of herbicides within the rows can control weeds. Newly planted trees may need watering because of insufficient rainfall.

The use of this soil as septic tank absorption fields is limited by the moderately slow permeability, but this limitation generally can be overcome by increasing the size of the absorption fields. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units I-1 dryland and I-3 irrigated, Silty range site, and windbreak suitability group 3.

MoC—Moody silty clay loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on ridgetops and side slopes of the loess uplands. Areas range from 5 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 7 inches thick. The subsoil is friable silty clay loam about 29 inches thick. The upper part is dark grayish brown and brown, and the lower part is yellowish brown. The underlying material to a depth of 60 inches is pale brown silty clay loam in the upper part and pale brown silt loam in the lower part (fig. 11).

Included with this soil in mapping are small areas of the eroded Moody and Nora soils on similar positions on the landscape. Small areas of saline-alkali soils are also included. The included soils make up 3 to 10 percent of the map unit.

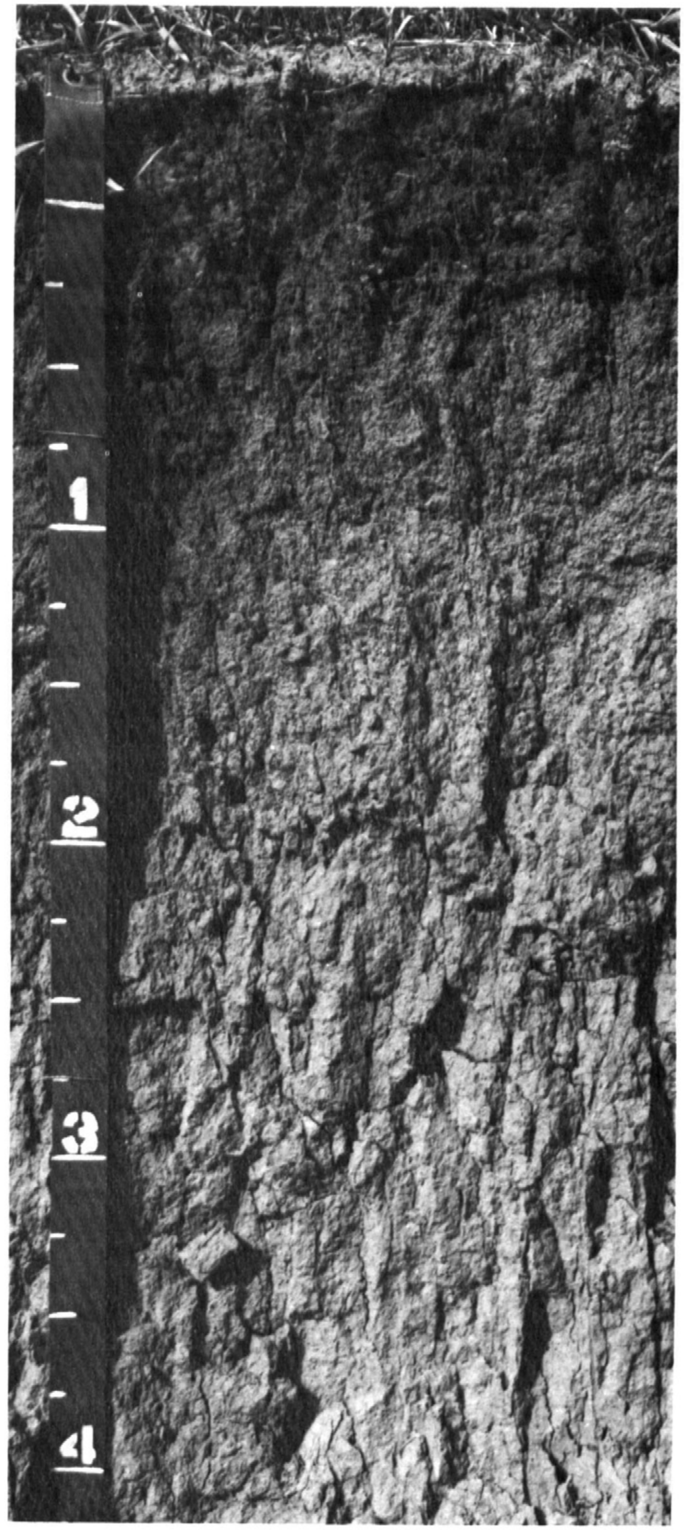

Figure 11.—Typical profile of Moody silty clay loam, 2 to 6 percent slopes, a well drained soil that has a well developed subsoil. The scale is in feet.

Permeability is moderately slow in this Moody soil, and available water capacity is high. Moisture is readily released to plants. The content of organic matter is moderate, and natural fertility is high. Runoff is medium. Tilth is good. The shrink-swell potential of this soil is moderate. The rate of water intake is low.

Most of the acreage of this soil is farmed. Most cultivated areas are used for dryland farming, but some are irrigated. A few small areas, generally near farmsteads, are in introduced grasses.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Erosion by water is the main hazard. Water conservation is an important management concern, especially during years of below-average rainfall. Terraces can help prevent soil erosion and loss of surface water. Conservation tillage practices, such as disking and chiseling, which keep crop residue on the surface, help conserve moisture for use by crops and prevent soil blowing.

Under irrigation, this soil is suited to corn, soybeans, and alfalfa. Erosion by water is the main hazard. Conservation tillage practices, such as disking, keep crop residue on the surface and thus help conserve water and control erosion. This soil is suited to bench leveling. Contour furrows are suitable if used with terraces and grassed waterways. This soil is particularly well suited to the center-pivot system of sprinkler irrigation. The rate at which water is applied should be controlled so it does not exceed the intake rate of this moderately fine textured, gently sloping soil.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet can cause compaction and reduce the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, properly planted on a well prepared site, can survive and grow well. They require care after planting if they are to survive. Weeds can be controlled by cultivating between the tree rows and by hand hoeing or careful use of herbicides in the rows. At times, rainfall is insufficient and newly planted trees need watering. Planting on the contour and terracing help conserve water and control erosion.

The use of this soil as septic tank absorption fields is limited by the moderately slow permeability and slope, but these limitations can generally be overcome by increasing the size of the absorption field and by installing the tile lines across the slope. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Foundations for buildings need to be strengthened and backfilled with coarse materials to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIe-1 dryland and IIIe-3 irrigated, Silty range site, and windbreak suitability group 3.

MoC2—Moody silty clay loam, 2 to 6 percent slopes, eroded. This deep, well drained, gently sloping soil is on side slopes and ridgetops of the loess uplands. Areas range from 5 to 150 acres in size. Rills and small gullies are common after heavy rains.

Typically, the surface layer is grayish brown, friable silty clay loam 6 inches thick. The subsoil is friable silty clay loam about 30 inches thick. The upper part is brown, the middle part is pale brown, and the lower part is light yellowish brown. The underlying material to a depth of 60 inches is very pale brown silt loam.

Over most of the mapped area, part of the original dark colored surface layer has been removed by erosion and tillage is in the remaining surface layer and the upper part of the subsoil.

Included with this soil in mapping are areas of uneroded Moody soils and the eroded Nora soils on similar positions on the landscape. A few small areas of saline-alkali soils are included. The included soils make up 5 to 10 percent of the map unit.

Permeability is moderately slow in this Moody soil, and available water capacity is high. Moisture is readily released to plants. The organic matter content is moderately low, and natural fertility is medium. Runoff is medium. Tilth is fair. Shrink-swell potential is moderate. The rate of water intake is low.

Most of the acreage of this soil is farmed. Most cultivated areas are used for dryland farming, but some are irrigated. A few small areas, generally near farmsteads, are in introduced grasses.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Erosion by water is the main hazard. During periods of prolonged drought, water conservation is an important concern. Terraces and grassed waterways used in combination with contour farming help prevent soil erosion and conserve water. Conservation tillage practices, such as disking or chiseling, keep crop residue on the soil surface and thus help conserve water and prevent erosion.

Under irrigation, this soil is suited to corn and soybeans, but it is better suited to close-growing crops such as alfalfa. Erosion by water is the main hazard. Contour furrows used in conjunction with terraces and grassed waterways help prevent erosion. Conservation tillage practices conserve water and help control erosion. This soil is suited to bench leveling. It is well suited to

sprinkler irrigation. It is particularly well suited to center-pivot sprinkler systems because the rate at which water is applied can be controlled so it does not exceed the intake rate of the soil.

This soil is suited to introduced grasses for pasture. Pastures commonly consist of smooth brome and orchardgrass or a mixture of grasses and alfalfa. Overgrazing or grazing when the soil is wet can cause compaction and reduce the water intake rate. Rotation grazing, proper stocking, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Using healthy seedlings of adapted species and a well prepared site helps assure survival and aids growth. Weeds can be controlled by cultivating between the tree rows and by hand hoeing or careful use of herbicides in the rows. At times, rainfall is insufficient and seedlings need watering.

The use of this soil as septic tank absorption fields is limited by the moderately slow permeability, but this limitation can generally be overcome by increasing the size of the absorption field. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good drainage. Crowning the roadbed by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIIe-8 dryland and IIIe-3 irrigated, Silty range site, and windbreak suitability group 3.

MoD—Moody silty clay loam, 6 to 11 percent slopes. This deep, well drained, strongly sloping soil is on side slopes of loess uplands. Areas range from 5 to 40 acres in size.

Typically, the surface layer is friable silty clay loam about 8 inches thick. The upper part is dark gray, and the lower part is dark grayish brown. The subsoil is friable silty clay loam about 19 inches thick. The upper part is brown, and the lower part is pale brown. The underlying material to a depth of 60 inches is mottled silt loam. The upper part is light yellowish brown, and the lower part is light gray and calcareous.

Included with this soil in mapping are small areas of eroded Moody soils and uneroded Nora soils on side slopes. These included soils make up 5 to 10 percent of the map unit.

Permeability is moderately slow in this Moody soil, and available water capacity is high. Moisture is readily released to plants. The organic matter content is moderate, and natural fertility is high. Runoff is medium. Tilth is good. The shrink-swell potential is moderate. The rate of water intake is low.

Most of the acreage of this soil is farmed. Most cultivated areas are used for dryland farming, but some are irrigated. A few small areas, generally near farmsteads, are in introduced or native grasses.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Erosion by water is the main hazard. Conservation of water is the main concern of management. Terraces and grassed waterways used in combination with contour furrowing help prevent erosion and conserve water. Conservation tillage practices, such as disking or chiseling, keep crop residue on the surface and thereby help conserve moisture for use by crops and prevent erosion.

Under irrigation, this soil is poorly suited to such row crops as corn. It is better suited to alfalfa and grass crops. Terracing and contour furrowing and the use of conservation tillage practices help conserve water and control erosion. This soil is generally better suited to sprinkler irrigation than to a gravity system. It is particularly well suited to the center-pivot type of sprinkler system because the rate at which water is applied can be controlled and less land reshaping is needed.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet can cause compaction and reduce the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to rangeland use. Overgrazing, untimely haying, or use of improper mowing height cause deterioration of the native plants, thereby reducing the protective cover and increasing erosion by water. Proper grazing use, a planned grazing system, and timely deferment of grazing or haying help maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species survive and grow well if planted on a well prepared site. Erosion can be controlled by terracing, planting trees on the contour, and using a cover crop. Weeds can be controlled by cultivating between the tree rows and by rototilling, hand hoeing, or careful use of herbicides in the rows. At times, rainfall is insufficient and young trees need watering.

The use of this soil as septic tank absorption fields is limited by the moderately slow permeability and slope of the soil. These limitations can generally be overcome by increasing the size of the absorption field and by shaping the site and installing the absorption field on the contour. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. If this soil is used as a site for dwellings and small commercial buildings, the structure should be designed to complement the slope or the site should be graded.

Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIIe-1 dryland and IVe-3 irrigated, Silty range site, and windbreak suitability group 3.

MoD2—Moody silty clay loam, 6 to 11 percent slopes, eroded. This deep, well drained, strongly sloping soil is on side slopes of loess uplands. Rills and small gullies are common after heavy rains. Areas range from 5 to 100 acres in size.

Typically, the surface layer is friable, dark grayish brown silty clay loam about 6 inches thick. The subsoil is friable silty clay loam about 20 inches thick. The upper part is brown, the middle part is pale brown, and the lower part is light brownish gray. The underlying material to a depth of 60 inches is pale brown, mottled silty clay loam. In places, the soil is calcareous at a depth of 40 to 60 inches.

Most of the original surface layer has been removed by erosion, and tillage is in the remaining surface layer and the subsoil. In places, the underlying material is at the surface.

Included with this soil in mapping are small areas of uneroded Moody and Nora soils on similar positions on the landscape. Also included are small areas of the coarser Thurman soils on side slopes. The included soils make up 3 to 6 percent of the map unit.

Permeability is moderately slow in this Moody soil, and available water capacity is high. Moisture is readily released to plants. The content of organic matter is moderately low, and natural fertility is medium. Runoff is medium. Shrink-swell potential is moderate. Tilth is fair. The rate of water intake is low.

Most of the acreage of this soil is farmed. Most cultivated areas are used for dryland farming, but a few are irrigated. A few small areas, generally near farmsteads, are in introduced grasses.

Under dryland farming, this soil is suited to corn, soybeans, and grain sorghum. It is better suited to close-growing crops such as alfalfa and small grain. Erosion by water is the main hazard. Conservation of water is a main concern of management. Growing crops in rotation helps lower the hazard of damage to crops by insects and diseases. Tillage practices that keep crop residue on the surface, terraces, and grassed waterways can be used to control erosion and conserve water.

Under irrigation, this soil is poorly suited to such row crops as corn. It is better suited to such close-growing crops as alfalfa. Erosion by water is the main hazard. Terraces, grassed waterways, and tillage practices that keep crop residue on the surface help control erosion and conserve water for use by plants. This soil is particularly well suited to sprinkler systems because the rate at which water is applied can be controlled and less earthmoving is needed to make the slope suitable for irrigation.

This soil is suited to introduced grasses for pasture. Pastures are generally smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Soil compaction and reduction in the water intake rate can result from overgrazing or from grazing when the soil is wet. Rotation grazing, fertilization with nitrogen, and proper stocking help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, planted on a well prepared site, can survive and grow well. Erosion can be reduced by terracing, planting trees on the contour, and using a cover crop. Weeds can be controlled by cultivating between the rows and by rototilling, hand hoeing, or careful use of herbicides in the rows. At times, rainfall is insufficient and young trees need watering.

The use of this soil as septic tank absorption fields is limited by the moderately slow permeability and slope. These limitations can generally be overcome by increasing the size of the absorption field and by shaping the site and installing the absorption field on the contour. For sewage lagoons, extensive grading is required to modify the slope and shape the lagoon. If this soil is used as a site for dwellings and small commercial buildings, the structure should be designed to complement the slope or the site should be graded. Foundations for buildings need to be strengthened and backfilled with coarse materials to prevent damage by the shrinking and swelling of the soil. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIIe-8 dryland and IVe-3 irrigated, Silty range site, and windbreak suitability group 3.

Na—Napa-Luton complex, 0 to 1 percent slopes. These deep, poorly drained soils formed in clayey alluvium on bottom lands of the Platte River Valley. These soils are occasionally flooded. Areas range from 15 to 400 acres in size.

This complex is 40 to 60 percent Napa soils and 35 to 60 percent Luton soils. Napa soils are generally slightly lower on the landscape than Luton soils.

Typically, the Napa soils have a surface layer of gray, very friable silt loam 1 inch thick. The subsoil is very firm

silty clay about 35 inches thick. The upper part is dark gray, and the lower part is very dark gray. This horizon is moderately saline and strongly or moderately alkaline. The underlying material to a depth of 60 inches is gray silty clay.

Typically, the Luton soils have a surface layer of very firm silty clay about 18 inches thick. This layer is gray in the upper part and very dark gray in the lower part. The subsoil is very firm silty clay about 15 inches thick. It is very dark gray in the upper part and dark gray in the lower part. The underlying material to a depth of 60 inches is very firm, gray silty clay. It is calcareous below a depth of about 37 inches.

Included with this soil in mapping are small areas of the calcareous Lawet soils and the noncalcareous Zook soils, on about the same landscape positions. These included soils make up 5 to 10 percent of the map unit.

Permeability is very slow, and available water capacity is moderate in the Napa and Luton soils. Moisture is released slowly to plants. The seasonal high water table ranges from a depth of about 1 foot in most wet years to a depth of about 3 feet in most dry years. The organic matter content is moderate. Natural fertility is low in Napa soils and medium in Luton soils. Runoff is very slow. The shrink-swell potential is high. Tilth is poor. The rate of water intake is very low.

About one-half of the acreage is cultivated, and one-half is in native range. Most cultivated areas are used for dryland crops, but a few are irrigated.

Under dryland farming, these soils are poorly suited to corn, alfalfa, soybeans, grain sorghum, and winter wheat. The salinity and alkalinity of the Napa soils are the main limitations (fig. 12). Wetness early in spring and droughtiness late in summer are concerns in managing these soils. Crops tolerant of a high salt content and strong alkalinity should be selected. Because of the excess salts, poor soil structure, and ponding of rainwater in the low areas, cultivated crops commonly do poorly unless a high level of management is used. Adequate surface drainage is needed. Land leveling and V-shaped ditches can help improve surface drainage. Feedlot manure makes the soil more friable and increases the intake of water. Phosphate fertilizer commonly improves the vigor and growth of plants. Conservation tillage practices, such as disking, protect these soils from crusting and loss of moisture.

Under irrigation, these soils are poorly suited to corn, soybeans, and alfalfa. The salinity and alkalinity of the Napa soils are the main limitations. Soil wetness caused by poor surface drainage and the water table also are concerns of management. Land leveling and shallow V-shaped ditches can improve surface drainage. The rate at which irrigation water is applied should be controlled so as not to exceed the very low water intake rate of the soils. Feedlot manure and crop residue incorporated into the surface layer can improve soil tilth and water intake. Conservation tillage practices keep these soils from crusting and improve intake of moisture. Phosphate fertilizers generally increase the growth and vigor of crops. Permanent reclamation of Napa soil areas is difficult. Sulfur and gypsum can be tried on an experimental basis to neutralize the high alkalinity.

These soils are suited to introduced grasses for pasture. They are best suited to tall wheatgrass, western wheatgrass, switchgrass, and other species that are tolerant of high salt content and alkalinity. Grazing when the soils are wet causes surface compaction and reduces the water intake rate. Proper stocking, rotation grazing, and application of nitrogen and phosphate fertilizer help keep the grasses in good condition.

These soils are suited to range. Overgrazing, untimely haying, and use of improper mowing height can reduce the protective vegetative cover and allow the invasion of undesirable plants. Grazing when the soil is wet can cause surface compaction. Proper grazing use, timely deferment of grazing, restriction on grazing during wet periods, and the use of a planned grazing system help keep the range in good condition.

Onsite investigation is needed in planning the use of these soils as sites for windbreaks. Napa soils generally are not suited to trees and shrubs because of the high salinity and alkalinity. Luton soils are suited to those species that can tolerate wetness. Weeds and grasses can be controlled by cultivating between the rows and by the use of herbicides, hand hoeing, or rototilling in the rows. Light cultivation and supplemental watering can be used to close cracks that form during dry weather.

These soils generally are not suited to use as septic tank absorption fields because of the very slow permeability and wetness of the soil material and the hazard of flooding. A suitable alternate site is needed. Sewage lagoons need dikes for protection from flooding. These soils are not suited to use as sites for buildings because of the hazard of flooding. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding damage and wetness. The use of coarser grained material for subgrade or base material insures good performance. Mixing the base material for roads and streets with additives such as hydrated lime helps prevent shrinking and swelling.

The soils in this complex are assigned to capability units IVs-1 dryland and IVs-1 irrigated. The Napa soils are in the Saline Subirrigated range site, and the Luton soils are in the Clayey Overflow range site. The Napa soils are in windbreak suitability group 10, and the Luton soils are in windbreak suitability group 2W.

NoC—Nora silty clay loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on side slopes and narrow ridgetops of uplands. It formed in loess. Areas range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 10 inches thick. The subsoil

Figure 12.—Soybeans grow poorly on the Napa soils in this area of Napa-Luton complex, 0 to 1 percent slopes.

is friable silty clay loam about 26 inches thick. The upper part is brown, and the lower part is pale brown. The underlying material to a depth of 60 inches is very pale brown, calcareous silty clay loam (fig. 13).

Included with this soil in mapping are small areas of Geary Variant silty clay loam at lower elevations. Outcrops of noncalcareous gray loess are also included. The inclusions make up 3 to 5 percent of this map unit.

Permeability is moderate in this Nora soil, and available water capacity is high. Moisture is readily released to plants. Organic matter content is moderate, and natural fertility is high. Runoff is moderate. Shrink-swell potential is moderate. Tilth is good. The rate of water intake is moderately low.

Most of the acreage of this soil is farmed. Most cultivated areas are used for dryland farming, but a few are irrigated. A few small areas, generally near farmsteads, are in introduced grasses.

Under dryland farming, this soil is suited to corn, soybeans, small grain, grain sorghum, and legumes, mainly alfalfa. Erosion by water is the main hazard. Row crops can be grown on the contour to reduce erosion and conserve water. Conservation tillage practices such as disking, chiseling, or no-tillage keep crop residue on the surface and thus help control erosion and prevent loss of soil moisture. Terraces and grassed waterways also help control erosion.

Under irrigation, this soil is suited to such row crops as corn and to such close-growing crops as alfalfa. Erosion by water is the main hazard. Bench leveling lowers the slope gradient for gravity irrigation and makes control of the water easier, but mixes calcareous soil with the tilled layer. This soil is particularly well suited to the center-pivot type of sprinkler irrigation system because land shaping is not needed and water application can be matched to the water intake rate. Conservation tillage

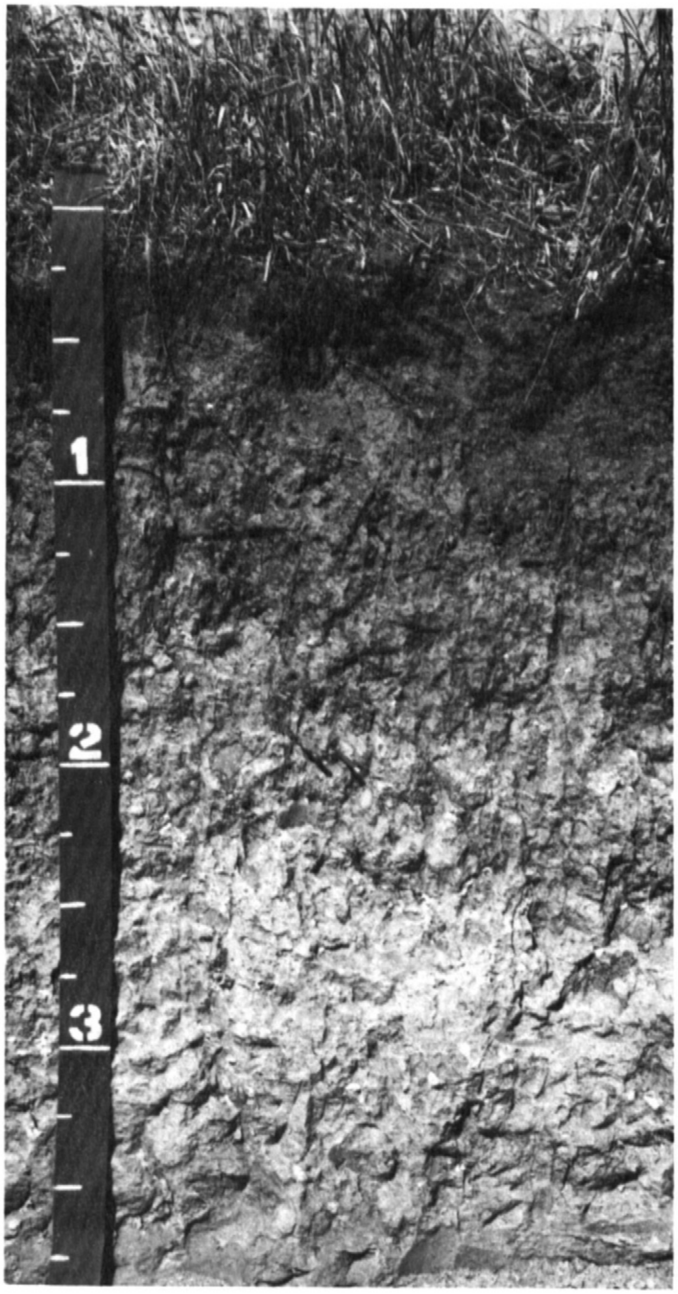

Figure 13.—Typical profile of Nora silty clay loam, 2 to 6 percent slopes. The scale is in feet.

practices help control erosion and conserve soil moisture for use by the crops. Contour furrows used with grassed waterways and terraces also help.

This soil is suited to pasture grasses. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet causes surface compaction and reduces the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen help to keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, properly planted on a well prepared site, can survive and grow well. They require care after planting if they are to continue to survive. Weeds can be controlled by cultivating between tree rows and by hand hoeing or careful application of herbicides in the rows. At times, rainfall is insufficient and newly planted trees need watering.

The use of this soil as septic tank absorption fields is limited by the moderate permeability and slope. These limitations can generally be overcome by increasing the size of the absorption field and by shaping the site and installing the absorption field on the contour. Sewage lagoons need to be lined or sealed to prevent seepage. Extensive grading is required to modify the slope and shape the lagoon. Foundations for buildings need to be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. If this soil is used as sites for small commercial buildings, the building should be designed to complement the slope, or the site should be graded. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the roadbed by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIe-1 dryland and IIIe-3 irrigated, Silty range site, and windbreak suitability group 3.

NoC2—Nora silty clay loam, 2 to 6 percent slopes, eroded. This deep, well drained, gently sloping soil is on side slopes and narrow ridges of uplands. It formed in loess. Rills are common after heavy rains. Areas range from 5 to 30 acres.

Typically, the surface layer is brown, friable silty clay loam about 6 inches thick. The subsoil is pale brown, friable silty clay loam about 25 inches thick. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam. In places, the underlying material is noncalcareous gray loess. In most areas of this soil, the original surface layer has been removed by erosion and tillage is mainly in the subsoil horizon.

Included with this soil in mapping are small areas of the calcareous Crofton soils on similar landscape positions. These included soils make 5 to 8 percent of the map unit.

Permeability is moderate in this Nora soil, and available water capacity is high. Moisture is readily released to plants. Organic matter content is moderately low, and natural fertility is medium. Runoff is moderate. The shrink-swell potential of this soil is moderate. Tilth is fair. The rate of water intake is moderately low.

Most of the acreage of this soil is farmed. Most cultivated areas are dryfarmed, but a few are irrigated. A few small areas, generally near farmsteads, are in introduced grasses.

Under dryland farming, this soil is suited to corn, soybeans, small grain, grain sorghum, and alfalfa. Erosion by water is the main hazard. Growing row crops on the contour reduces runoff and erosion and conserves water. Terraces and grassed waterways help prevent further erosion. Conservation tillage practices, which keep all or most of the crop residue on the surface, help control erosion and save soil moisture for use by plants. Feedlot manure can be used to improve fertility.

Under irrigation, this soil is suited to corn and alfalfa. Erosion by water is the main hazard. This soil is suited to sprinkler and gravity systems of irrigation. It is particularly well suited to the center-pivot type of sprinkler system. Conservation tillage can be used to help control erosion. Bench leveling and the use of contour furrows with terraces also help control erosion. Fertility can be improved by the use of commercial fertilizer, barnyard manure, and cover crops.

This soil is suited to pasture grasses. Pastures generally are smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet causes surface compaction and reduces the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, properly planted on a well prepared site, can survive and grow well. They require care after planting if they are to continue to survive. Weeds can be controlled by cultivating between rows and by hand hoeing or careful use of herbicides in the rows. At times, rainfall is insufficient and newly planted trees need watering. Terracing and planting the trees on the contour help prevent erosion.

The use of this soil as septic tank absorption fields is limited by the moderate permeability, but this limitation can generally be overcome by increasing the size of the absorption field. Sewage lagoons should be lined or sealed to prevent seepage. Grading is required to modify the slope and shape the lagoon. Foundations for buildings should be strengthened and backfilled with coarse materials to prevent damage by shrinking and swelling of the soil. If this soil is used as sites for small commercial buildings, the building should be designed to complement the slope, or the site should be graded. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the roadbed by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIIe-8 dryland and IIIe-3 irrigated, Silty range site, and windbreak suitability group 3.

NoD—Nora silty clay loam, 6 to 11 percent slopes. This deep, well drained, strongly sloping soil is on side slopes of uplands. This soil formed in loess. Areas range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 9 inches thick. The subsoil is friable silty clay loam about 18 inches thick. The upper part is brown, and the lower part is pale brown. The underlying material to a depth of 60 inches is very pale brown, mottled, calcareous silt loam. Small areas of this soil are eroded.

Included with this soil in mapping are small areas of Moody soils on similar landscapes. These included soils make up 5 to 10 percent of the map unit.

Permeability is moderate in this Nora soil, and available water capacity is high. Moisture is readily released to plants. Runoff is medium. Organic matter content is moderate, and natural fertility is high. The shrink-swell potential is moderate. Tilth is good. The rate of water intake is moderately low.

Most of the acreage of this soil is in pasture or rangeland. The grasses commonly are introduced grasses, but in a few areas they are native species. They are generally used for grazing, but some are used for hay.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. The soil is better suited to close-growing crops than to row crops because of the hazard of erosion. Conservation of water is an important concern of management. Conservation tillage practices, such as disking, chiseling, and no-tillage, conserve moisture for use by crops and help control water erosion. Terracing, contour farming, crop rotation, and the use of grassed waterways are other practices that help control erosion and conserve water.

Under irrigation, this soil is poorly suited to such row crops as corn, but is better suited to such close-growing crops as alfalfa. Erosion by water is the main hazard. Conservation tillage, contour farming, and the use of grassed waterways and terraces help control erosion. This soil is generally better suited to the sprinkler irrigation method than to other methods because the water is easier to control and apply. It is particularly well suited to the center-pivot type of sprinkler system.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet causes compaction and reduces the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to native grasses for rangeland. Overgrazing, untimely haying, or use of improper mowing

height reduce the protective cover and cause deterioration of the native plants. A planned grazing or haying system and deferred grazing can help maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, properly planted on a well prepared site, can survive and grow well. Weeds can be controlled by cultivating between the tree rows and by hand hoeing or careful use of appropriate herbicides in the rows. Erosion can be controlled by terracing and planting the trees on the contour. At times, rainfall is insufficient and newly planted trees need watering.

The use of this soil as a site for sanitary facilities is limited by the slope and moderate permeability. For septic tank absorption fields the slope limitation can generally be overcome by shaping the site and installing the absorption field on the contour; and the permeability limitation can generally be overcome by increasing the size of the absorption field. Sewage lagoons should be lined or sealed to prevent seepage. Grading is required to modify the slope and shape the lagoon.

Foundations for buildings should be strengthened and backfilled with coarse material to prevent damage by shrinking and swelling of the soil. If this soil is used as a site for dwellings and small commercial buildings, the structure should be designed to complement the slope, or the site should be graded. The pavement and subbase of roads and streets should be thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action in the soil can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIIe-1 dryland and IVe-3 irrigated, Silty range site, and windbreak suitability group 3.

NoE—Nora silty clay loam, 11 to 15 percent slopes. This deep, well drained, moderately steep soil is on side slopes of uplands. It formed in loess. Areas range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 9 inches thick. The subsoil is friable silty clay loam about 23 inches thick. The upper part is brown, and the lower part is pale brown. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam.

Included with this soil in mapping are a few small areas of the less sloping Nora soils.

Permeability is moderate in this Nora soil, and available water capacity is high. Moisture is readily released to plants. Organic matter content is moderate, and natural fertility is high. The shrink-swell potential is moderate. Runoff is rapid. Tilth is good. The rate of water intake is moderately low.

Most of the acreage of this soil is in pasture and rangeland. The grasses commonly are introduced species, but in a few areas they are native species. The grasses are generally used for grazing, but a few are used for hay.

Under dryland farming, this soil is poorly suited to corn, grain sorghum, small grain, and alfalfa. It is best suited to close-growing crops, but row crops can be grown under a high level of management that adequately controls erosion. Erosion by water is the main hazard. Terraces, grassed waterways, and farming on the contour can be used to help control erosion and conserve water. Conservation tillage practices, which keep all or part of the crop residue on the surface, help conserve water and control erosion.

This moderately steep soil is not suited to irrigation because of the difficulty in controlling the water and controlling erosion.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet compacts the soil and reduces the water intake rate. Proper stocking, fertilization with nitrogen, and rotation grazing help keep the pasture grasses in good condition.

This soil is suited to rangeland use. Overgrazing, untimely haying, or use of improper mowing height reduce the protective plant cover and allow invasion of less palatable grasses. Proper range use, deferment of grazing, and the use of a planned grazing system help maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, properly planted on a well prepared site, can survive and grow well. Cultivation can control weeds between the tree rows; and hand hoeing, rototilling, or careful use of herbicides can control weeds in the rows. Erosion can be controlled by planting trees on the contour. At times, rainfall is insufficient and newly planted trees and shrubs need watering.

The use of this soil as a site for sanitary facilities is limited by the slope and moderate permeability. For septic tank absorption fields, the slope limitation can generally be overcome by shaping the site and installing the absorption field on the contour; and the permeability limitation can generally be overcome by increasing the size of the absorption field. Sewage lagoons should be lined or sealed to prevent seepage. Extensive grading is required to modify the slope and shape the lagoon. For sewage lagoons, it usually is practical to consider an alternate site.

Foundations for buildings should be strengthened and backfilled with coarse material to prevent damage by shrinking and swelling of the soil. If this soil is used as a site for dwellings and small commercial buildings, the building should be designed to complement the slope, or the site should be graded. The pavement and subbase of roads and streets should be thick enough to

compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads and streets by frost action in the soil can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability unit IVe-1, Silty range site, and windbreak suitability group 3.

NpD2—Nora-Crofton complex, 6 to 11 percent slopes, eroded. This map unit consists of deep, well drained, strongly sloping soils on uplands. The soils formed in loess. Rills and small gullies are common after heavy rains. Areas range from 5 to 200 acres in size.

Nora soils make up 50 to 75 percent of each mapped area. Crofton soils, which generally are steeper than the Nora soils, make 20 to 45 percent of each mapped area.

Typically, the Nora soils have a surface layer of brown, friable silty clay loam about 6 inches thick. The subsoil is friable silty clay loam about 16 inches thick. The upper part is light brownish gray, and the lower part is light gray. The underlying material to a depth of 60 inches is calcareous silt loam. It is light gray in the upper part and very pale brown in the lower part.

Typically, the Crofton soils have a surface layer of grayish brown, friable, calcareous silt loam about 6 inches thick. The underlying material to a depth of 60 inches is calcareous, light gray, mottled silt loam.

Erosion has not been uniform in areas of these soils. In most places, however, most of the original dark surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil or the underlying material.

Included with these soils in mapping are a few small areas of the Steinauer soils that formed in glacial till and are lower on the landscape. Also included are small areas of the light brown Geary Variant soils below the Nora and Crofton soils and small areas of alkali soils on side slopes. The included soils make up 3 to 8 percent of the map unit.

Permeability is moderate and available water capacity is high in the Nora and Crofton soils. The soils release moisture readily to plants. In Nora soils the content of organic matter is moderately low and natural fertility is medium. In Crofton soils the content of organic matter and natural fertility are low. Runoff is rapid. In Nora soils the shrink-swell potential is moderate, and in Crofton soils it is low. Tilth is fair. The water intake rate is low for Nora soils and moderately low for Crofton soils.

Most of the acreage of this complex is farmed. Most cultivated areas are used for dryland farming, but a few areas are irrigated. A few areas are in introduced grasses and used for pasture.

Under dryland farming, these soils are poorly suited to corn and grain sorghum and are best suited to such close-growing crops as alfalfa and small grain. Erosion by water is the main hazard. Conservation of water and maintenance of fertility are major concerns of management. Terraces and grassed waterways can help conserve moisture and control erosion (fig. 14). Conservation tillage practices, such as disking and chiseling, keep crop residue on the surface and thereby conserve moisture for use by plants and help control erosion. Returning crop residue to the soil, spreading feedlot manure, and using commercial fertilizer help improve fertility. The high amount of carbonates in Crofton soils tends to make phosphorus unavailable for use by plants. Crofton soils require extra fertilization with phosphorus to successfully grow most crops, particularly legumes and small grain.

Under irrigation, these soils are poorly suited to corn. They are better suited to such close-growing crops as alfalfa. Erosion is the main hazard. Conservation of water and improving the fertility are the major management concerns. Conservation tillage practices help conserve water and control erosion. Contour farming in combination with terracing and the use of grassed waterways help control erosion and conserve water. These soils are particularly well suited to the center-pivot type of sprinkler irrigation system.

The soils in this complex are suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Grazing when the soil is wet or overgrazing can compact the soil and reduce the water intake rate. Proper stocking, fertilization with nitrogen, and rotation grazing help keep the grasses in good condition.

These soils are suited to trees and shrubs for windbreaks. Planting healthy seedlings of adapted species on the contour, terracing, and planting a cover crop between the rows can help control erosion. The careful use of herbicides helps control weeds. Newly planted trees may need watering during extended periods of drought.

The use of these soils as sites for sanitary facilities is limited by slope. For septic tank absorption fields, land shaping and installing the absorption field on the contour generally are necessary. Sewage lagoons should be lined or sealed to prevent seepage. They also require extensive grading to modify the slope and shape the lagoon. In areas of the Nora soils, permeability is an additional limitation for septic tank absorption fields. This limitation, however, can generally be overcome by increasing the size of the absorption field.

The use of these soils as sites for dwellings and small commercial buildings is limited by slope. A building should be designed to complement the slope, or the site should be graded. In areas of the Nora soils, foundations for buildings should be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil material.

If these soils are used as sites for roads and streets, the pavement and subbase should be thick enough to compensate for the low strength of the soil material. The

Figure 14.—Pushup terraces help to control erosion in this area of Nora-Crofton complex, 6 to 11 percent slopes, eroded.

use of coarser grained material for subgrade or base material insures better performance. In areas of the Nora soils, damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the roadbed by grading and constructing adequate side ditches help provide the needed surface drainage.

These soils are assigned to capability units IIIe-8 dryland and IVe-3 irrigated. The Nora soils are in the Silty range site, and the Crofton soils are in the Limy Upland range site. The Nora soils are in windbreak suitability group 3, and the Crofton soils are in windbreak suitability group 8.

NpE2—Nora-Crofton complex, 11 to 15 percent slopes, eroded. This map unit consists of deep, well drained, moderately steep soils on side slopes on uplands. The soils formed in loess. Rills and small gullies are common after heavy rains. Areas of this unit range from 5 to 100 acres.

Nora soils make up 40 to 70 percent of each mapped area. Crofton soils, which are steeper than the Nora soils, make up 30 to 50 percent of each mapped area.

Typically, the Nora soils have a surface layer of brown, friable silty clay loam about 5 inches thick. The subsoil is pale brown, friable silty clay loam about 21 inches thick. The underlying material to a depth of 60 inches is very pale brown, mottled, calcareous silt loam.

Typically, the Crofton soils have a surface layer of pale brown, very friable silt loam about 5 inches thick. Below that is a transition layer of pale brown, very friable, mottled silt loam about 3 inches thick. The underlying material to a depth of 60 inches is mottled, light gray silt loam.

Erosion has not been uniform in areas of this map unit. In most places, however, most of the original dark surface layer has been removed by erosion and tillage has mixed the rest with the subsoil or underlying material.

Included in mapping are small areas of the light brown or brown Geary Variant soils, which are slightly lower on the landscape. Small areas of Steinauer soils, which formed in glacial till, are below the major soils. Small areas of alkali soils are in some higher lying areas on the side slopes. The included soils make up 3 to 8 percent of the map unit.

Permeability is moderate, and available water capacity is high in the Nora and Crofton soils. The soils release moisture readily to plants. The organic matter content is moderately low in Nora soils and low in Crofton soils. Tilth is fair. Runoff is rapid on both soils. Shrink-swell potential is moderate in Nora soils and low in Crofton soils.

Most of the acreage of this map unit is farmed. Most cultivated areas are used for dryland farming; only a few are irrigated. Some small areas are in introduced or native grasses and are used for grazing or haying.

Under dryland farming, these soils are poorly suited to corn and grain sorghum. Because of the hazard of erosion by water, these moderately steep soils are better suited to close-growing crops, such as alfalfa and small grain. Conservation of water and improving fertility of the soils are major concerns of management. Conservation tillage practices, such as disking, chiseling, and no-tillage, help control erosion and conserve water. Contour farming in combination with the use of terraces and grassed waterways is a good way to conserve moisture and control erosion. Spreading feedlot manure, keeping crop residue on the surface, and adding commercial fertilizer help improve fertility. In the Crofton soils the abundant free carbonates tend to make phosphorus unavailable for use by plants. Areas of these soils require extra fertilization with phosphorus to successfully grow most legumes.

The soils in this complex are not suited to irrigation because the hazard of erosion is too severe and management of the irrigation water is too difficult.

These soils are suited to introduced grasses for pasture. Pastures consist of smooth brome or a mixture of smooth brome and alfalfa or of orchardgrass and alfalfa. Grazing when the soil is wet or overgrazing can compact the surface and reduce the water intake rate. Rotation grazing, proper stocking, and fertilization with nitrogen can help keep the grasses in good condition.

These soils are suited to rangeland use. The use of these soils as rangeland is an effective method of erosion control. Overgrazing, untimely haying, and use of improper mowing height, however, cause deterioration of the native plants and reduce the protective cover, thereby allowing severe erosion by water. Timely deferment of grazing or haying and the use of a planned grazing system help maintain or improve the range condition.

These soils are suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species planted on the contour, terraces, and cover crops can control erosion. Herbicides can help control weeds. At times, rainfall is insufficient and newly planted trees need watering.

The use of these soils as sites for sanitary facilities is limited by slope. For septic tank absorption fields, land shaping and installing the absorption field on the contour are generally necessary. Sewage lagoons should be lined or sealed to prevent seepage. They also require extensive grading to modify the slope and shape the lagoon. In areas of the Nora soils, permeability is an additional limitation for septic tank absorption fields. This limitation, however, can generally be overcome by increasing the size of the absorption field.

The use of these soils as sites for dwellings and small commercial buildings is limited by slope. A building should be designed to complement the slope, or the site should be graded. In areas of the Nora soils, foundations for buildings should be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil material.

If these soils are used as sites for roads and streets, the pavement and subbase should be thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. In areas of the Nora soils, damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the roadbed by grading and constructing adequate side ditches help provide the needed surface drainage.

These soils are assigned to capability unit IVe-8 dryland. The Nora soils are in the Silty range site, and the Crofton soils are in the Limy Upland range site. The Nora soils are in windbreak suitability group 3, and the Crofton soils are in windbreak suitability group 8.

Of—Ord fine sandy loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands of the Platte River Valley. This soil is occasionally flooded. Areas range from 10 to 60 acres in size.

Typically, the surface layer is very friable fine sandy loam about 16 inches thick. It is dark gray in the upper part and stratified gray and light gray in the lower part. The underlying material to a depth of 60 inches is light brownish gray, mottled, and calcareous fine sandy loam in the upper part and light gray, mottled fine sand in the lower part. In places, the underlying material is coarse sand and gravel below a depth of 20 inches. Also, in places, the upper part of the underlying material is fine sand.

Included with this soil in mapping are small areas of Inavale soils at higher elevations. Also included are areas where the surface layer is loam. The included soils make up 3 to 8 percent of the map unit.

Permeability is moderately rapid in the upper part of the Ord profile and rapid in the lower part. Available water capacity is moderate. Moisture is readily released to plants. The seasonal high water table ranges in depth from about 1.5 feet in most wet years to about 3.5 feet in most dry years. The organic matter content is moderately low, and natural fertility is medium. Runoff is slow. Tilth is good. The rate of water intake is moderately high.

Most of the acreage of this soil is in cultivated crops. Most cultivated areas are irrigated. A few areas are in introduced or native grasses used for grazing or haying.

Under dryland farming, this soil is suited to corn, grain sorghum, small grain, and legumes. The main limitation is wetness. Tillage generally is delayed early in spring. Soil blowing is a minor hazard. Conservation tillage practices, which keep crop residue on the surface, help prevent soil blowing and build up the supply of organic matter.

Under irrigation, this soil is suited to such row crops as corn and soybeans and to such close-growing crops as alfalfa. Both gravity and sprinkler irrigation systems can be used on this soil. Land leveling is generally needed for an efficient gravity system. A cover crop helps prevent soil blowing.

This soil is suited to introduced grasses for pasture. Such species as reed canarygrass and creeping foxtail grow well. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to rangeland use. Overgrazing, untimely haying, and use of improper mowing height can reduce the protective plant cover and allow the invasion of less palatable grasses. Proper grazing use, deferment of grazing, and use of a planned grazing and haying system can maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks. Competition from weeds and grass for moisture is a common problem. Weeds can be controlled by cultivating between the tree rows and by hand hoeing or applying herbicides in the rows. The species selected should be able to tolerate a moderately high water table.

This soil generally is not suited to septic tank absorption fields or buildings because of the flooding and wetness. A suitable alternate site is needed. Sewage lagoons need to be lined or sealed to prevent seepage. They also need to be diked for protection from flooding. The lagoons need to be constructed on fill material to raise the bottom of the lagoon above the seasonal high water table. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Damage to roads from flooding can be prevented by constructing the road on suitable, well compacted fill material above flood level and by providing adequate side ditches and culverts. Damage to roads by frost action can be reduced by providing good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIw-6 dryland and IIw-8 irrigated, Subirrigated range site, and windbreak suitability group 2S.

Pb—Pits and dumps. This miscellaneous area consists mainly of piles of reworked gravel, sand, and overburden and the adjacent pits, which are filled with water. The sand and gravel are stockpiled for use in construction. Individual areas range from 5 to 80 acres.

Typically, the material to a depth of 60 inches consists of a mixture of fine, medium, and coarse sand and gravelly sand.

Included with this unit in mapping are small areas of Platte-Inavale complex, channeled. These soils make up 3 to 8 percent of this miscellaneous area.

Permeability of the material in this map unit is rapid or very rapid, and available water capacity is very low. The organic matter content is very low, and natural fertility is low. The level of the water in the pit areas is the level of the water table. The seasonal high water table generally is at a depth of 6 to 10 feet. The areas of sand are devoid of vegetation, except where they are no longer used for commercial purposes. Runoff is very slow.

The areas of this map unit are used for commercial mining of sand and gravel and temporary storage of the material. They are not suited to cultivated crops, pasture, range, or trees. However, they are used as recreation areas. The water filled pits are resting areas for wetland wildlife.

Cottonwood, willow, and pine are the most suitable trees for either individual or scattered plantings. Small trees require special care after planting if they are to survive. They need protection from blowing sand. A native grass cover or wooden barriers can be used. Newly planted trees may need watering. Grass, shrubs, and trees for landscaping around summer cottages generally are difficult to establish.

This miscellaneous area is suited to recreation development. In some areas where pumping of the sand and gravel has ceased, summer cottages and some permanent homes have been constructed around the shore line of the pits. If septic tank absorption fields are installed, special care needs to be taken so that the water table does not become contaminated. This miscellaneous area is not suited to sewage lagoons. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Roads can be built. Some areas are used as beaches. Many of the pits are 25 to 50 feet deep; therefore, to make them safe for swimming, some of the sand should be used to give a gradual slope to the lake bottom. Activities commonly available in areas of this map unit are fishing, boating, water skiing, rock hunting, swimming, hiking, and picnicking.

This unit is assigned to capability unit VIIIs-8 and windbreak suitability group 10. It is not assigned to a range site.

Pc—Platte loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is shallow over coarse sand mixed with gravel. It is on bottom lands of the Platte River Valley. This soil is occasionally flooded. The areas range from 5 to 160 acres in size.

Typically, the surface layer is light brownish gray, very friable loam about 11 inches thick. The upper 6 inches of the underlying material is stratified, light gray, and light brownish gray, mottled fine sandy loam. The lower part to a depth of 60 inches is light gray coarse sand that is about 8 percent gravel.

Included with this soil in mapping are small areas of Alda, Boel, and Inavale soils. The Alda soils are moderately deep over coarse sand or gravelly sand. The Boel soils are deep and have fine sand in the underlying material. The Inavale soils are deep and excessively drained and have less gravel in the underlying material.

All the included soils are slightly higher on the landscape than the Platte soil. They make up 3 to 8 percent of this map unit.

Permeability is moderately rapid in the upper part of this Platte soil and very rapid in the underlying gravelly sand. Available water capacity is low. Moisture is released readily to plants. The seasonal high water table is at a depth of about 1 foot in most wet years and 2 feet in most dry years. Late in summer the water table recedes to a depth of about 5 feet. Root growth is limited by the coarse sand and gravelly sand in the underlying material. The organic matter content is moderately low, and natural fertility is low. Runoff is slow. Tilth is fair. The rate of water intake is moderately low or moderate.

Most of the acreage of this unit is in native grasses. A few small areas are cultivated and irrigated with a center-pivot system.

This soil is poorly suited to dryfarmed corn, small grain, and grain sorghum. Tillage operations commonly are delayed early in spring because of wetness. Late in summer, the water table recedes to a depth of about 5 feet and the soil is droughty. Removing excess surface water early in spring is helpful. Surface V-shaped drains can be used if outlets are available. Soil blowing is a minor hazard in summer. A cropping system that leaves a maximum of crop residue on the surface helps protect the soil.

This soil is also poorly suited to irrigated corn and soybeans. It is not suited to alfalfa because of wetness. Soil blowing can be reduced by leaving crop residue on the surface as a mulch. Surface drainage can be provided by installing shallow V-shaped ditches. Effective lowering of the water table is difficult, but in places, tile drains are helpful. This soil is suited to sprinklers, generally of the center-pivot type. Frequent applications of water are needed because the available water capacity is low. Light applications of water are needed to avoid excessive leaching of plant nutrients.

This soil is suited to introduced grasses for pasture. Such species as creeping foxtail, reed canarygrass, alsike clover, and red clover grow well. Proper stocking, rotation grazing, and fertilization with nitrogen help keep the grasses in good condition.

This soil is suited to rangeland use. Overgrazing, untimely haying, or use of improper mowing height reduce the protective cover and cause deterioration of the native plants. When the soil is wet, overgrazing can cause surface compaction. In places, small mounds or bogs make it difficult to graze or mow for hay. Proper grazing, a planned grazing system, deferment of grazing, and restriction on grazing during wet periods help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks; however, only to those species tolerant of the moderately high water table. Competition from grass and weeds for moisture is a common concern of management. Cultivating between the rows and using herbicides in the rows can help control weeds and undesirable grasses.

This soil generally is not suited to use as septic tank absorption fields or building sites because of the occasional flooding and the wetness. A suitable alternate site is needed. If this soil is used as a site for sanitary facilities other than septic tanks, special care needs to be taken so that the ground water does not become contaminated. Sewage lagoons need to be sealed or lined to prevent seepage. They need to be diked for protection from flooding. Lagoons need to be constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. Damage to roads from flooding and wetness can be prevented by constructing the road on suitable, well compacted fill material above flood level and by providing adequate side ditches and culverts. Damage to roads by frost action can be reduced by providing good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IVw-4 dryland and IVw-13 irrigated, Subirrigated range site, and windbreak suitability group 2S.

Px—Platte-Inavale complex, channeled. This map unit consists of soils on bottom lands of the Platte River Valley. The areas consist mainly of old shallow channels that alternate with slightly higher, uneven areas. The Platte soils are somewhat poorly drained and frequently flooded, and the Inavale soils are somewhat excessively drained and occasionally flooded. Areas of this complex range from 5 to 800 acres in size.

The Platte soils, which are on the lowest parts of the landscape, make up 50 to 65 percent of each area. The Inavale soils make up 30 to 45 percent of each area.

Typically, the Platte soils have a surface layer of light brownish gray, very friable loam about 11 inches thick. The underlying material to a depth of about 17 inches is stratified light gray and light brownish gray, mottled fine sandy loam. Below that, to a depth of 60 inches, it is light gray coarse sand that is 8 percent gravel.

Typically, the Inavale soils have a surface layer of light gray, loose loamy fine sand about 5 inches thick. Beneath this is a transition layer of very pale brown, loose loamy fine sand about 20 inches thick. The underlying material to a depth of 60 inches is light gray loamy fine sand.

Included with these soils in mapping are small areas of the moderately deep, somewhat poorly drained Alda soils at slightly higher elevations and the deep, somewhat poorly drained Boel and Ord soils on slightly higher parts of the landscape. These included soils make up about 3 to 8 percent of the map unit.

Permeability of the Platte soils is moderately rapid in the upper part and very rapid in the lower part. Permeability is rapid in the Inavale soils. The available

water capacity is low for Platte and Inavale soils. The organic matter content is moderately low for Platte soils and low for Inavale soils. These soils have low natural fertility. The seasonal high water table for the Platte soils is at a depth of about 1 foot in most wet years and 2 feet in most dry years. The seasonal high water table for the Inavale soils is at a depth greater than 6 feet. Both soils release moisture readily to plants. Runoff is slow. Shrink-swell potential for both soils is low.

Areas of these soils are used almost entirely for grazing and hayland. Where they occur on islands in the Platte River, they are used mostly for recreation and wildlife habitat. Most areas are in native grass with many scattered native trees, shrubs, and forbs.

The soils in this map unit are not suited to cultivated crops, either dryland or irrigated. The combination of flooding and wetness in spring and droughtiness late in summer are the main hazards.

These soils are poorly suited to introduced grasses for pasture and are generally not used for pasture. Flooding in spring and droughtiness late in summer are the main hazards.

These soils are suited to rangeland. Overgrazing, however, can reduce the protective cover and cause deterioration of the native plants. In the lowest areas, bogs form if the soils are grazed when they are very wet. Proper grazing use, timely deferment of grazing, and the use of a planned grazing system help improve the range condition.

The Platte soils in this map unit are not suited to trees and shrubs for windbreaks. The Inavale soils are suited only to those species that can withstand drought. Cover crops can be maintained between the rows to prevent soil blowing. Weeds near the trees can be hoed by hand. At times, rainfall is not sufficient and watering is needed.

These soils are generally not suited to use as septic tank absorption fields or as sites for sewage lagoons or buildings because of the flooding and the high water table of the Platte soils. Seepage of effluent into the ground water is a severe hazard. A suitable alternate site is needed. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing roads on suitable, well compacted fill material above flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding and wetness. In areas of Platte soils, damage to roads by frost action can be reduced by providing good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

The soils in this complex are assigned to capability unit VIw-7 dryland. The Platte soils are in the Subirrigated range site, and the Inavale soils are in the Sandy Lowland range site. The Platte soils are in windbreak suitability group 10, and the Inavale soils are in windbreak suitability group 7.

So—Shell silt loam, occasionally flooded, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on high bottom lands. It is occasionally flooded. Areas range from 5 to over 2,000 acres in size.

Typically, the surface soil is grayish brown, friable silt loam about 24 inches thick. The underlying material to a depth of 60 inches is stratified grayish brown and light brownish gray, friable silt loam in the upper part. In the lower part, it is dark grayish brown and light brownish gray silt loam that is mottled and calcareous. In places, the soil is stratified above a depth of 10 inches.

Small areas of the somewhat poorly drained Colo soils are included in mapping. They are lower on the landscape than the Shell soil. These included soils make up 5 to 10 percent of the map unit.

Permeability is moderate in this Shell soil, and available water capacity is high. Moisture is released readily to plants. The organic matter content is moderate, and natural fertility is high. Runoff is slow. Tilth is good. The rate of water intake is moderately low.

Most of the acreage of this soil is farmed. Most cultivated areas are irrigated, but some are used for dryland farming. A few small areas are in introduced grasses.

Under dryland farming, this soil is suited to corn, soybeans, oats, winter wheat, and alfalfa. Floodwaters recede within a few hours and damage generally is slight. Conservation tillage practices, such as disking or chiseling, keep all or most of the crop residue on the surface and thus help conserve moisture for use by crops.

Under irrigation, this soil is suited to corn and soybeans and to such close-growing crops as alfalfa. This soil is suited to gravity and sprinkler systems of irrigation. If a gravity system is used, land leveling and a tailwater recovery system can increase efficiency of water use. The rate at which water is applied needs to be adjusted so as not to exceed the intake rate of the soil. Surface drainage with V-shaped ditches helps remove floodwater, although damage from flooding is generally slight. Conservation tillage practices help control soil blowing.

This soil is suited to introduced grasses for pasture. Overgrazing when the soil is wet, however, can cause surface compaction and reduce the water intake rate. Rotation grazing, fertilizing with nitrogen, and proper stocking help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, properly planted on a well prepared site, can survive and grow well. Care after planting is needed if they are to survive. Cultivating between the tree rows and hoeing or careful use of herbicides in the rows can control weeds. At times, rainfall is insufficient and newly planted trees need watering.

This soil is generally not suited to use as septic tank absorption fields or as a building site because of the occasional flooding. A suitable alternate site is needed.

Sewage lagoons need to be sealed or lined to prevent seepage and diked for protection from flooding. Constructing roads on suitable compacted fill material above flood level and providing adequate side ditches and culverts help prevent damage to roads from flooding. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIw-3 dryland and IIw-6 irrigated, Silty Lowland range site, and windbreak suitability group 1.

Sp—Shell silt loam, clayey substratum, 0 to 2 percent slopes. This deep, moderately well drained, nearly level soil is on bottom lands of broad drainageways. Areas range from 10 to 320 acres in size. They are subject to occasional flooding.

Typically, the surface layer is dark grayish brown, friable silt loam about 17 inches thick. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, friable silt loam in the upper part. In the lower part, it is dark grayish brown and very dark gray, calcareous silty clay. In places, the clayey substratum is above a depth of 40 inches.

Permeability is moderate in the upper part of the profile and slow in the lower part. Available water capacity is high. Moisture is released readily to plants. The organic matter content is moderate. Runoff is slow. Natural fertility is high. The seasonal high water table is perched at a depth of 2.5 to 4 feet, generally in spring. The rate of water intake is moderate.

Nearly all the acreage of this soil is farmed. A few small areas of introduced grasses are adjacent to farmsteads. Most of the cultivated areas are dryfarmed. A few areas are irrigated, generally by the gravity system.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Conservation of water is a major concern of management. Conservation tillage practices keep crop residue on the surface and help conserve moisture for use by plants. The clayey substratum holds moisture in the upper part of the profile, thus benefiting crops during periods of low rainfall. This soil tends to dry more slowly in spring than better drained soils.

Under irrigation, this soil is suited to such row crops as corn, soybeans, and sorghum and to such close-growing crops as alfalfa and small grain. It is well suited to gravity and sprinkler systems of irrigation. If a gravity system is used, land leveling and a tailwater recovery system increase efficiency of water use. The rate at which water is applied needs to be adjusted so as not to exceed the intake rate. Planting of crops early in spring is generally delayed by wetness.

This soil is suited to introduced grasses for pasture. Overgrazing or grazing when the soil is wet can cause surface compaction and reduce the water intake rate. Rotation grazing, fertilizing with nitrogen, and proper stocking help keep the grasses in good condition.

This soil is suited to trees and shrubs for windbreaks. Healthy seedlings of adapted species, properly planted on a well prepared site, can survive and grow well. Care after planting is needed if they are to survive. Cultivating between the tree rows and hoeing or careful use of herbicides in the rows can control weeds. At times, rainfall is insufficient and newly planted trees need watering.

This soil is generally not suited to use as septic tank absorption fields or as a building site because of the occasional flooding. A suitable alternate site is needed. Sewage lagoons need to be lined or sealed to prevent seepage, and they need to be diked for protection from flooding. They also need to be constructed on fill material so that they are above the seasonal high water table. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Constructing roads on suitable, well compacted fill material and providing adequate side ditches and culverts help prevent damage to roads from flooding and wetness. Damage to roads by frost action can be reduced by providing good surface drainage and by the use of a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIw-4 dryland and IIw-6 irrigated, Silty Lowland range site, and windbreak suitability group 1.

StD2—Steinauer clay loam, 6 to 11 percent slopes, eroded. This deep, well drained, strongly sloping soil formed in glacial till on uplands. It generally occurs along the middle of side slopes. Areas range from 5 to 60 acres in size.

Typically, the surface layer is dark grayish brown and light gray, friable, calcareous clay loam about 5 inches thick. The underlying material to a depth of 60 inches is light gray and very pale brown, mottled, calcareous clay loam. Small pebbles commonly are scattered throughout the profile (fig. 15).

Over most of a mapped area, the original surface layer has been partly removed by erosion and tillage has mixed the remaining part with the underlying material.

Included with this soil in mapping are small areas of the redder Geary Variant soils that are higher on the landscape. Also included are areas where 6 to 18 inches of light brown or reddish loess covers the glacial till. The

Figure 15.—Typical profile of Steinauer clay loam, 6 to 11 percent slopes, eroded. The scale is in feet.

included soils make up about 3 to 8 percent of this map unit.

Permeability is moderately slow in this Steinauer soil, and available water capacity is high. Soil workability is poor because of the presence of scattered stones and pebbles. Moisture is released slowly to plants. The organic matter content and natural fertility are low. Runoff is medium. Shrink-swell potential is moderate. Tilth is fair. The rate of water intake is low.

Most of the acreage of this soil is dryfarmed. A few small areas, generally near farmsteads, are in introduced or native grasses.

Under dryland farming, this soil is poorly suited to corn and grain sorghum but is better suited to such close-growing crops as alfalfa and small grain. Erosion by water is the main hazard. Conservation of water and improvement of soil fertility are concerns of management. Terraces, grassed waterways, and field borders in combination with contour farming can help prevent erosion and conserve water. Conservation tillage practices, such as disking or chiseling, help prevent erosion and conserve moisture. Feedlot manure helps improve both fertility and tilth.

This strongly sloping soil is not suited to irrigation because of the severe erosion hazard and the difficulty of controlling irrigation water.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or of a mixture of smooth brome, alfalfa, and other cool-season grasses. Overgrazing reduces the protective plant cover and increases the hazard of erosion. Proper stocking, deferment of grazing, and fertilization with nitrogen help improve or maintain the growth and vigor of the plants.

This soil is suited to rangeland use. A good cover of native grasses helps prevent erosion. Only half the native forage should be grazed each year. The other half should be left for the following year so that the grass can store carbohydrates in the root system to insure a healthy stand. Maintenance of a healthy stand of desirable grass prevents invasion by undesirable plants. Proper grazing use, timely deferment of grazing, and the use of a planned grazing system help maintain or improve the range condition.

This soil is suited to trees and shrubs for windbreaks. Only species tolerant of a high calcium content and droughty conditions should be planted in this soil. Planting on the contour and terracing can help prevent excessive runoff and lessen the erosion hazard. Weeds can be controlled by cultivating between the tree rows and by hand hoeing or careful use of appropriate herbicides in the rows. At times, water may be needed because of drought.

The use of this soil for septic tank absorption fields is limited by the moderately slow permeability and the slope. These limitations can generally be overcome by increasing the size of the absorption field and by constructing the tile lines on the contour. For sewage lagoons, extensive grading is required to modify the

slope and shape the lagoon. Foundations for buildings need to be strengthened and backfilled with coarse materials to prevent damage by shrinking and swelling of the soil. If this soil is used as a site for dwellings and small commercial buildings, the structure should be designed to complement the slope, or the site should be graded. Roads need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability unit IVe-8 dryland, Limy Upland range site, and windbreak suitability group 8.

StF2—Steinauer clay loam, 11 to 30 percent slopes, eroded. This deep, well drained soil is moderately steep and steep. It is on side slopes of glacial uplands, commonly in a band along the middle of the slope. Areas range from 5 to 230 acres in size.

Typically, the surface layer is light brownish gray, friable, calcareous clay loam about 4 inches thick. Beneath this is a transition layer of light gray, friable, calcareous clay loam about 10 inches thick. The underlying material to a depth of 60 inches is light gray, mottled, calcareous clay loam. Small pebbles are scattered throughout the profile.

Most areas of this soil have been farmed. Most of the original surface layer has been eroded away, and the present surface layer is a mixture of the original surface layer and the underlying material.

Included with this soil in mapping are areas of the light brown or brown Geary Variant soils that are higher on the landscape. Also included are areas where 6 to 18 inches of reddish loess crops out above the Steinauer soil. The included soils make up about 3 to 8 percent of this map unit.

Permeability is moderately slow, and available water capacity is high. Stones and small boulders are common in areas of this soil. Moisture is released slowly to plants The organic matter content and natural fertility are low. Runoff is rapid. The rate of water intake is low.

Most of the acreage of this soil is in native or introduced grasses that are used for grazing or for hay (fig. 16).

This soil is not suited to dryfarmed or irrigated crops because the slope is too steep and the hazard of erosion is too severe.

This soil is suited to introduced grasses for pasture. The pastures generally consist of smooth brome or a mixture of smooth brome, alfalfa, and other cool-season grasses. Overgrazing or untimely haying increase the erosion hazard by reducing the protective vegetative cover. Proper stocking, deferment of grazing, and fertilization with nitrogen help keep the grasses vigorous and healthy.

The use of this soil as rangeland is effective in controlling erosion. Overgrazing, untimely haying, or use of improper mowing height reduce the protective cover and cause deterioration of the potential native plant community. These practices can also result in severe gullying. Proper grazing use, timely deferment of grazing or haying, and the use of a planned grazing system help maintain or improve the range condition.

This soil is not suited to trees and shrubs for windbreaks unless they are planted by hand. The areas are too steep and erodible for planting trees with machinery. In some areas, however, trees can be planted by hand to provide habitat for wildlife.

This soil generally is not suited to use as septic tank absorption fields or as a site for sewage lagoons because of the steepness of slope. A suitable alternate site is needed. This soil is generally not suited to use as a site for dwellings and small commercial buildings except on the lower slopes, where an acceptable gradient can be obtained by grading. Cutting and filling are generally needed to provide a suitable grade for roads and streets. Roads need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Damage to roads by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability unit VIe-8 dryland, Limy Upland range site, and windbreak suitability group 10.

TmC2—Thurman-Moody complex, 2 to 6 percent slopes, eroded. This map unit consists of a deep, somewhat excessively drained Thurman soil and a deep, well drained Moody soil. Both soils are gently sloping and are about midway on side slopes of uplands that are adjacent to valleys. In places, water erosion has been severe and the underlying material is at the surface. In places, the silty and sandy soil material is intermixed. Areas range from 5 to 60 acres in size.

About 65 to 80 percent of each mapped area is Thurman loamy fine sand, and about 15 to 30 percent is Moody silty clay loam. The two soils are so intricately mixed that it is not possible to separate them at the scale used in mapping.

Typically, the Thurman soil has a surface layer of grayish brown, very friable loamy fine sand about 9 inches thick. Beneath this is a transition layer of pale brown, loose loamy fine sand about 6 inches thick. The underlying material to a depth of 60 inches is very pale brown fine sand.

Typically, the Moody soil has a surface layer of dark

Figure 16.—Steinauer clay loam, 11 to 30 percent slopes, eroded, is well suited to permanent grasses.

grayish brown, friable silty clay loam about 6 inches thick. The subsoil is friable silty clay loam about 14 inches thick. It is grayish brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is pale brown silt loam in the upper part, light gray fine sandy loam in the middle part, and very pale brown fine sand in the lower part.

Included in mapping are small areas of eroded Nora soils.

Permeability is rapid in the Thurman soil and moderately slow in the Moody soil. Moisture is released readily to plants. The organic matter content is moderately low in both soils. Natural fertility is low in the Thurman soil and medium in the Moody soil. Runoff is slow on the coarse textured Thurman soil and medium on the silty Moody soil. Shrink-swell potential is low in the Thurman soil and medium in the Moody soil. Tilth is only fair. The intake rate of water is very high for the Thurman soil and moderately low for the Moody soil.

Most of the acreage of this map unit is farmed. Most of the cropland is irrigated. A few small areas are in introduced grasses for pasture.

Under dryland farming, these soils are suited to corn, grain sorghum, and close-growing cultivated crops such as alfalfa and small grain. The suitability of these soils for row crops is marginal, and in a good cropping system row crops should be grown infrequently. Conservation of water is an important concern of management. Keeping crop residue on the surface by the use of conservation tillage practices such as disking or chiseling is an effective way to prevent erosion and increase intake of water.

Under irrigation, these soils are suited to corn, soybeans, and alfalfa. The soils are best suited to sprinkler irrigation. They are particularly well suited to the center-pivot type of sprinkler system. Frequent applications of water are needed. Maintaining a high amount of crop residue on the surface, strip-cropping and keeping tillage to a minimum help control erosion.

These soils are suited to introduced grasses for pasture. The pasture can consist of either a single species or a mixture of cool-season grasses and a legume. Overgrazing or grazing when the soil is wet can

compact the soil and reduce the water intake rate. Proper stocking, deferment of grazing, and the use of nitrogen fertilizer can help keep the grasses vigorous.

The soils in this map unit are suited to trees and shrubs for windbreaks. Soil blowing is a hazard in areas of the Thurman soil. In these areas the trees can be planted in a shallow furrow and the soil should not be cultivated. Weeds and grasses can be controlled by careful use of herbicides. Erosion by water is a hazard on both the Moody and Thurman soils. Newly planted trees may need watering at times.

In areas of this map unit, onsite investigation is needed before sanitary facilities or buildings are constructed. The Thurman soil readily absorbs the effluent from septic tank absorption fields, but it does not adequately filter the effluent. The poor filtering capacity of that soil may result in pollution of the ground water. The Moody soil is limited for use as septic tank absorption fields because of its moderately slow permeability, but this limitation generally can be overcome by increasing the size of the absorption field. Sewage lagoons constructed in areas of this complex should be sealed or lined to prevent seepage. Grading is required to modify the slope and shape the lagoon.

The Thurman soil is suited to use as a site for buildings and roads. Disturbed areas, however, should be revegetated to prevent soil blowing. The use of the Moody soil as a site for buildings and local roads and streets is limited by the shrink-swell potential and low strength of the soil and by the hazard of frost action in the soil. Foundations for buildings should be strengthened and backfilled with coarse material to prevent damage by the shrinking and swelling of the soil. The surface and subbase of roads should be thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance of the road. Damage to roads by frost action in the soil can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

The soils in this map unit are assigned to capability units IIIe-5 dryland and IIIe-11 irrigated. The Thurman soil is in the Sandy range site, and the Moody soil is in the Silty range site. The Thurman soil is in windbreak suitability group 5, and the Moody soil is in group 3.

TmD2—Thurman-Moody complex, 6 to 11 percent slopes, eroded. This map unit consists of a deep, somewhat excessively drained Thurman soil and a deep, well drained Moody soil. Both soils are strongly sloping and are about midway on the side slopes of uplands that are adjacent to valleys. Areas of this unit range from 5 to 60 acres in size.

About 60 to 75 percent of each mapped area is Thurman loamy fine sand, and about 20 to 30 percent is Moody silty clay loam. The two soils are so intricately mixed that it is not possible to separate them at the scale used in mapping.

Typically, the Thurman soil has a surface layer of very friable loamy fine sand about 9 inches thick. This surface layer is grayish brown in the upper part and brown in the lower part. Beneath this is a transition layer of pale brown, very friable loamy fine sand about 16 inches thick. The underlying material to a depth of 60 inches is light gray and very pale brown fine sand.

Typically, the Moody soil has a surface layer of dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is friable silty clay loam about 30 inches thick. It is dark brown in the upper part, brown in the middle part, and pale brown in the lower part. The underlying material to a depth of 60 inches is pale brown silt loam in the upper part and very pale brown loamy fine sand in the lower part.

Included in mapping are small areas of eroded Nora soils.

Erosion has not been uniform. In many places, the surface layer of both soils has been partly removed by erosion and tillage has mixed the remaining part with the subsoil or underlying material. In places, tillage is in the subsoil of the Moody soil and in the underlying material of the Thurman soil.

Permeability is rapid in the Thurman soil and moderately slow in the Moody soil. Moisture is readily released to plants. The organic matter content is moderately low in both the Thurman and Moody soils. Natural fertility is low in the Thurman soil and medium in the Moody soil. Runoff is slow on the coarse textured Thurman soil and medium on the silty Moody soil. Shrink-swell potential is low in the Thurman soil and moderate in the Moody soil. Tilth is fair in both soils. The rate of water intake is very high in the Thurman soil and low in the Moody soil.

Most of the acreage of this map unit is cultivated. Most cultivated areas are dryfarmed, but some are irrigated. A few small areas are in introduced grasses for pasture.

Under dryland farming, these soils are suited to corn and grain sorghum and to close-growing crops such as alfalfa and small grain. Water erosion and soil blowing are hazards. Row crop yields are marginal, and in a good cropping system row crops are grown infrequently. Conservation of water is an important concern of management. Conservation tillage practices, such as disking and chiseling, keep a cover of crop residue on the surface and help control both soil blowing and water erosion.

Under irrigation, the soils in this unit are suited to corn and alfalfa. Erosion is the main hazard. These soils are better suited to sprinkler irrigation than to other methods of water distribution. They are particularly well suited to the center-pivot type of sprinkler system. Frequent applications of water are needed. Maintaining a large amount of crop residue on the surface, stripcropping, and keeping tillage to a minimum all help control soil blowing and water erosion.

These soils are suited to introduced grasses for pasture. Pastures can consist of either a single species

or a mixture of cool-season grasses and a legume. Proper stocking, deferment of grazing, and fertilization with nitrogen help keep the grasses in good condition.

These soils are suited to trees and shrubs for windbreaks. Soil blowing and droughtiness are hazards in areas of the Thurman soil. In those areas the trees should be planted in a shallow furrow and the soil should not be cultivated. Weeds and grasses can be controlled by careful use of appropriate herbicides. Erosion by water is a hazard in areas of the Moody soil. At times, rainfall is insufficient and newly planted trees need watering.

In all areas of this map unit, onsite investigation is needed before sanitary facilities or buildings are constructed. Disturbed areas need to be revegetated to prevent erosion by wind and water. The Thurman soil readily absorbs the effluent from septic tank absorption fields, but it does not adequately filter the effluent. The poor filtering capacity of the soil may result in pollution of the ground water. The Moody soil is limited for use as septic tank absorption fields by its moderately slow permeability, but this limitation can generally be overcome by increasing the size of the absorption field. Sewage lagoons constructed in areas of this complex should be sealed or lined to prevent seepage. Extensive grading is required to modify the slope and shape the lagoon.

The use of the Thurman soil as a site for buildings and roads is limited by slope. For buildings, this limitation can be overcome by designing the structure to complement the slope or by grading the site. For roads, this limitation can be overcome by cutting and filling.

The Moody soil is limited for use as a site for small commercial buildings by slope and is limited for use as a site for dwellings by slope and shrink-swell potential. The slope limitation can be overcome by designing the structure to complement the slope or by grading the site. Damage to dwellings caused by the shrinking and swelling of the soil can be prevented by strengthening the foundations and backfilling them with coarse material. The use of the Moody soil as a site for roads is limited by the low strength of the soil and the hazard of frost action in the soil. The surface and subbase of roads should be thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade and base material insures better performance. Damage to roads by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

The soils in this complex are assigned to capability units IVe-5 dryland and IVe-11 irrigated. The Thurman soil is in the Sandy range site, and the Moody soil is in the Silty range site. The Thurman soil is in windbreak suitability group 7, and the Moody soil is in windbreak suitability group 3.

Zo—Zook silty clay loam, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is on bottom lands of the Platte River Valley and Maple Creek Valley. It is in the old channels or on the lower parts of the landscape. This soil is occasionally flooded. Areas range from 5 to 300 acres in size.

Typically, the surface soil is about 27 inches thick. The upper part is dark gray, firm silty clay loam; the middle part is very dark gray, firm silty clay loam; and the lower part is very dark gray, very firm silty clay. The subsoil is very dark gray, very firm silty clay about 9 inches thick. The underlying material to a depth of 60 inches is silty clay. The upper part is dark gray, and the lower part is gray and mottled. In some areas, the soil is calcareous between depths of 10 and 50 inches.

Included with this soil in mapping are small areas of Zook soils that have 6 to 10 inches of silt loam overwash and are on slightly higher parts of the landscape. Also included are small areas of the saline-alkali Napa soils on slightly lower parts of the landscape. The included soils make up 5 to 15 percent of this map unit.

Permeability is slow in this Zook soil, and available water capacity is high. Moisture is released slowly to plants. The seasonal high water table is at a depth of about 1 foot in most wet years and at about 3 feet in most dry years. The organic matter content is high, and natural fertility is medium. Runoff is slow. The shrink-swell potential is high. Tilth is fair. The rate of water intake is very low.

Most of the acreage of this soil is cultivated cropland. Most of the cropland is dryfarmed, but some is irrigated. A few areas are in introduced grasses and are generally used for haying.

Under dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Soil wetness is the main limitation. Surface water commonly stands in low areas for several days after rains and thus delays tillage operations. Land leveling and shallow surface ditches can be used to improve surface drainage. In places, tile drains can lower the water table and help control wetness. Crop residue should be left on the surface. This generally can be done by chiseling late in fall. Unless snow or some protective cover is on the soil during winter, soil blowing can be a serious hazard. Diversions and proper land treatment in the drainage areas above areas of this soil can be beneficial in reducing flood damage.

Under irrigation, this soil is suited to such row crops as corn and soybeans and to such close-growing crops as alfalfa. Soil wetness, mainly because of the water table, is the main limitation. Land leveling can improve surface drainage and increase efficiency of the irrigation system. Shallow surface ditches can be installed where a suitable outlet is available. This soil is suited to both gravity and sprinkler irrigation. Spreading feedlot manure and keeping crop residue on the surface help make this soil more friable and improve the water intake rate.

This soil is suited to introduced grasses for pasture. Such species as reed canarygrass and creeping foxtail

grow well. Overgrazing or grazing when the soil is wet can cause surface compaction and reduce the water intake rate. Proper stocking, rotation grazing, and fertilization with nitrogen and phosphorus help keep the grasses healthy and vigorous.

This soil is suited to trees and shrubs for windbreaks. Species that can tolerate the moderately high water table and occasional flooding should be selected. Competition from weeds for moisture is a management concern. Cultivating between the tree rows helps control weeds. The soil cracks in dry weather; therefore, shallow cultivation should be used to close the cracks so that roots do not dry out.

This soil generally is not suited to use as septic tank absorption fields or building sites because of the flooding and wetness. A suitable alternate site is needed. Sewage lagoons should be constructed on fill material to raise the bottom of the lagoon above the seasonal high water table. They also need to be diked for protection from flooding. Roads and streets need to be designed so that the pavement and subbase are thick enough to compensate for the low strength of the soil material. The use of coarser grained material for subgrade or base material insures better performance. Constructing roads on suitable, well compacted fill material and providing adequate side ditches and culverts help protect the roads from flood damage and wetness. Damage to roads by frost action can be reduced by providing good surface drainage and by using a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help provide the needed surface drainage.

This soil is assigned to capability units IIw-4 dryland and IIw-1 irrigated, Clayey Overflow range site, and windbreak suitability group 2W.

Use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and sites for windbreaks; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where wetness or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and pasture

Prepared by William E. Reinsch, conservation agronomist, Soil Conservation Service.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Most of the agricultural land in Colfax County is used as cultivated cropland. The largest acreage is in corn and soybeans. Other crops are small grain, alfalfa, hay, and sorghum. About 68 percent of the harvested cropland is dryfarmed.

The potential of the soils in Colfax County for increased food production is good. About 248,000 acres is suitable for dryland crops.

Dryland management

Good management practices for dryland crops are those that reduce runoff and the hazard of erosion, conserve moisture, improve tilth, and maintain fertility. Most of the soils in Colfax County are suitable for crop production. In many places, however, erosion is a severe hazard and should be reduced by suitable conservation practices.

Terraces, contour farming, grassed waterways, and tillage systems that keep crop residue on the surface help reduce water erosion. Keeping crop residue on the surface or growing a protective plant cover helps prevent the sealing and crusting of the soil during and after heavy rains. In winter, stubble catches drifting snow that can provide additional moisture.

Soil blowing is a minor hazard in Colfax County. It can be controlled by keeping a mulch of crop residue on the surface of the soil, conservation tillage, contour stripcropping, and planting narrow field windbreaks. Overall, the hazard of erosion can be reduced if the more productive soils are used for row crops and the steeper, more erodible soils are used for close-growing crops, such as small grain and alfalfa, or for hay and pasture. Proper land use alone can reduce the erosion hazard in many places.

Insufficient rainfall is a main limitation affecting dryland crops. A cropping system that conserves moisture and controls water erosion and soil blowing is needed.

A cropping system is a planned sequence of crops grown on a field, in combination with the practices needed for the management and conservation of the

soil. On soils used for dryland crops, the cropping system should preserve tilth and fertility, maintain a crop residue cover that protects the particular soil from erosion, and control weeds, insects, and diseases. The cropping system selected should be the best suited to the soil. For example, the crop sequence on Crofton silt loam, 11 to 15 percent slopes, eroded, should include a high percentage of grass and legume crops. On Belfore silty clay loam, 0 to 2 percent slopes, however, row crops can be grown more frequently.

Preparation of the seedbed helps control weeds and provide a favorable growth medium for plants. Excessive tillage, however, breaks down the granular structure in the surface layer, which is needed for good tilth. Tillage should be kept to a minimum. Various systems of conservation tillage are used in Colfax County. An example is till-plant, a system in which row crops are planted at the same time that the soil is tilled and tillage is restricted to the row. Also used in this survey area is a system in which the soil is tilled with disks or chisels, which keep tillage at a minimum, and crop residue is on the surface when crops are planted. Grass seeds can be drilled into a cover of stubble without further seedbed preparation.

Additional nutrients are needed in some of the soils used for dryland crops. The kind and amount of fertilizer to be applied should be based on the results of soil tests and on the soil's moisture content at the time of application. If the subsoil is dry and the amount of rainfall is low, the rate at which fertilizer is applied should be slightly lower than the rate needed when the soil is moist. On all soils used for non-legume crops, nitrogen fertilizer is beneficial. Phosphorus and zinc are needed for the more eroded soils and for soils that have been cut during construction of terraces or diversions. Dryland crops require smaller amounts of fertilizer than irrigated crops because the plant population and the supply of available moisture are generally lower.

On soils in capability classes I, IIw, and IIIw the best management includes a planned crop rotation, use of crop residue, application of fertilizer or barnyard manure, and good agronomic practices. On soils of Class IIe the best practices are a good cropping sequence, allowing the crop residue to remain on the soil over winter, contour farming, use of grassed waterways, and use of a conservation tillage system that leaves crop residue on about 40 percent of the surface after the crops have been planted.

On soils of Classes IIIe and IVe, the best management practices are a cropping sequence that limits row crops, leaving the standing crop residue on the soil over winter, contour farming, terracing, the use of grassed waterways, and the use of a conservation tillage system that leaves crop residue on about 40 percent of the surface after the crops have been planted. On slopes over 10 percent, reduction of water erosion to an acceptable level can be accomplished by planting grasses and legumes in the cropping sequence or by establishing a conservation tillage system for row crops that leaves more than 3,000 pounds of corn or sorghum residue per acre on the surface after the crops have been planted.

Some soils in Colfax County, such as those in the Fillmore series, are subject to ponding. Unless ponding can be controlled, only crops that are tolerant of a wet soil should be planted.

Herbicides can be successfully used to control weeds; the kind and amount, however, should be carefully controlled. The amount applied should be determined by the colloidal clay and humus fraction of the soil, which is responsible for most of the chemical activity in the soil. The more clay and humus, the greater the amount of herbicide required. An excessive amount of herbicide results in crop damage on moderately coarse and coarse soils, which are low in content of colloidal clay, and on soils that are moderately low to low in content of organic matter. Establishing field boundaries on the contour helps maintain the content of organic matter in the field and thus helps prevent crop damage caused by herbicides.

On soils that have a high water table the methods of improving crop production are varied and not always completely effective. If planting is simply delayed by wetness the selection of a crop that has a short growing season may be the solution. Ridge planting can be used to provide a warm, well aerated root zone. A grid tile system with a pump at the outlet can be used, but it may be too expensive. Good natural outlets for a tile drainage system are not available in many places L and smoothing and the use of shallow W- or V-shaped ditches help remove surface water so that the soil can be tilled. These open ditches can have slopes gentle enough to be crossed by farm machinery.

Saline-alkali soils, such as Gayville Variant and Napa soils are naturally unsuitable for many climatically adapted plants. Surface or subsurface drains can make these soils suitable for some crops if adequate outlets are available. Crops and forage plants that have a good degree of salt tolerance can be grown. Barley and wheat are more salt tolerant than soybeans or corn. Tall wheatgrass and birdsfoot trefoil are more salt tolerant than alfalfa and orchardgrass.

Irrigation management

About 20 percent of the cropland in Colfax County is irrigated. Corn is grown on 60 percent of the irrigated cropland. A smaller acreage is used for soybeans and alfalfa. Corn and soybeans can be irrigated by a furrow or sprinkler method and alfalfa by a border, contour ditch, corrugation, or sprinkler method. The irrigation water is drawn mainly from wells.

The management needed in irrigated areas includes selection of a proper cropping sequence; land leveling, which results in an even distribution of irrigation water; measures that conserve moisture and control water

erosion; and selection of a rate of water application that does not exceed the absorption rate of the soil.

The cropping sequence on soils that are well suited to irrigation is dominated by row crops. One that includes different row crops, small grain, and alfalfa or grass helps control the diseases and insects that are common if the same crop is grown year after year.

A gently sloping soil, such as Moody silty clay loam, 2 to 6 percent slopes, is subject to water erosion in areas where it is irrigated by furrows that run downslope. Contour bench leveling or a combination of contour furrows and parallel terraces helps control water erosion in these areas. In areas where a sprinkler system is used, terraces, contour farming, grassed waterways, and a conservation tillage system that keeps crop residue on the surface help control water erosion. They also conserve water.

If an adequate amount of water is available, sprinklers are most effective on the coarser textured soils. They can be used on the more sloping as well as the nearly level soils. They are either center-pivot sprinklers, which revolve around a central point, or are sets of sprinklers installed at various locations in the field. The water can be applied at a rate that does not exceed the absorption rate of the soil and thus result in excessive runoff. Because the water can be carefully controlled, sprinklers are effective in helping to establish new pastures on moderately steep soils. In summer, however, much of the water is lost through evaporation. Keeping crop residue on the surface increases the intake rate and decreases the evaporation rate. Wind drift can result in an uneven distribution of water in some areas.

Soil holds only a limited amount of water. The silt loams and silty clay loams in Colfax County, for example, hold about 2 inches of available water per foot of soil depth. Thus, a soil that is 4 feet deep and is planted to a crop that sends its roots to that depth can hold about 8 inches of water available for that crop. Irrigation should begin when about half of the available water has been used by the crop. Applying the water at regular intervals helps keep the soil moist throughout at all times. An interval varies according to the crop and the time of year.

A tailwater recovery pit at the end of a field that is furrow irrigated helps trap excess irrigation tailwater. This water can then be pumped to the upper ends of the field and used again. Pits increase the efficiency of the irrigation system and conserve the supply of underground water.

All of the soils in Nebraska are assigned to irrigation design groups, which are described in the Nebraska Irrigation Guide (*6*). The Arabic numerals shown in the designations of irrigation capability units at the end of the map unit descriptions under the heading "Detailed soil map units" indicate the irrigation design groups to which the soils are assigned.

Assistance in planning and designing an irrigation system is available through the local office of the Soil Conservation Service or the county agricultural agent. Estimates concerning cost of equipment can be obtained from dealers and manufacturers of irrigation equipment.

Pasture and hayland management

Areas that are used for hay or pasture should be managed for maximum production. A rotation grazing system that results in a uniform distribution of grazing is needed. Many forage plants are a good source of minerals, vitamins, protein, and other nutrients. A well managed pasture can provide a balanced ration throughout the growing season. Adding plant nutrients to the soil helps to obtain maximum production. The kinds and amounts of fertilizer needed should be determined by soil tests. If pastures are irrigated, a high level of management is needed.

A mixture of grasses and legumes can be grown in rotation with grain crops on many soils. The grasses and legumes improve tilth, increase the organic matter content, and help control erosion. They are ideal as part of a conservation cropping system.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the

Cooperative Extension Service can provide information about the management and productivity of the soils.

Land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIw-4 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

Prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It may be cropland, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for producing food or fiber or is available for these uses. The soil qualities, growing season, and moisture supply are those needed for a well managed soil economically to produce a sustained high yield of crops. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at local offices of the Soil Conservation Service.

Some parts of the County have been losing some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and difficult to cultivate and are less productive.

The map units in Colfax County that are considered prime farmland are listed in this section. This list does

not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. Some map units are considered prime farmland only in areas that are adequately drained. The soil qualities that affect use and management are described in the section "Detailed soil map units."

About 135,490 acres, or nearly 52 percent of the total acreage, in Colfax County meets the requirements for prime farmland. The map units that meet these requirements are:

AcC—Alcester silt loam, 2 to 6 percent slopes
Be—Belfore silty clay loam, 0 to 2 percent slopes
Bf—Belfore silty clay loam, terrace, 0 to 2 percent slopes
Bh—Blendon fine sandy loam, 0 to 2 percent slopes
BnC—Blendon loam, 2 to 6 percent slopes
Cg—Colo silty clay loam, 0 to 2 percent slopes (where drained)
CrC2—Crofton silt loam, 2 to 6 percent slopes, eroded
Ed—Eudora loam, sandy substratum, 0 to 2 percent slopes
Ha—Hall silty clay loam, sandy substratum, 0 to 1 percent slopes
Hb—Hobbs silt loam, 0 to 2 percent slopes
Mo—Moody silty clay loam, 0 to 2 percent slopes
MoC—Moody silty clay loam, 2 to 6 percent slopes
MoC2—Moody silty clay loam, 2 to 6 percent slopes, eroded
NoC—Nora silty clay loam, 2 to 6 percent slopes
NoC2—Nora silty clay loam, 2 to 6 percent slopes, eroded
Of—Ord fine sandy loam, 0 to 2 percent slopes
So—Shell silt loam, occasionally flooded, 0 to 2 percent slopes
Sp—Shell silt loam, clayey substratum, 0 to 2 percent slopes
Zo—Zook silty clay loam, 0 to 1 percent slopes (where drained)

The Colo soil, map unit Cg, generally has been adequately drained, either by the application of drainage measures or through incidental drainage that results from farming, roadbuilding, and other kinds of land development.

Rangeland

Prepared by Peter N. Jensen, range conservationist, Soil Conservation Service.

Rangeland, or native pasture, amounts to approximately 3 percent of the total agricultural land in Colfax County. It largely occurs along the Platte River in the Platte-Inavale soil association and the Shell Creek bluffs in the Steinauer-Moody soil association. Most rangeland is in the Silty, Limy Upland, Subirrigated, and Sandy Lowland range sites. The average size of livestock farms is about 320 acres.

Generally in Colfax County, livestock producers raise small herds of cows and calves and sell the calves in the fall as feeders. From late spring through early fall, livestock are allowed to graze the rangeland. In the spring, they graze on smooth brome, and in the fall and early in winter, they graze on corn or grain sorghum stalks. During the rest of the winter, they are fed native or alfalfa hay, silage, or both hay and silage.

Approximately 2,500 acres of cropland in Colfax County is used for rangeland. A mixture of adapted native grasses has been planted on this land. Some of the rangeland has been overgrazed, and only plants that produce little forage remain. Commonly, broadleaf weeds are abundant on these pastures. There is some migration of shrubs on the steeper slopes and of shrubs and trees along the Platte River. The productivity of the range can be increased by proper management practices such as establishing a planned grazing system that includes proper grazing and timely deferment of grazing and by brush and weed management. In addition, range seeding can be applied in cropland areas where soil loss exceeds tolerable limits.

Farmers who want technical help with reseeding presently cropped land to grass, with setting up a planned grazing system, or with other aspects of a range program can obtain that help from the local office of the Soil Conservation Service.

Woodland

By Keith Ticknor, forester, Soil Conservation Service.

Most of the woodland in Colfax County is along bottom lands of the Platte River Valley and along its principal tributaries. Some small woodlots are on rough or steep land, and many of the small drainageways are wooded. Some wooded areas are capable of producing commercial wood products, but most of them are unmanaged and are retained for watershed protection and wildlife habitat.

Eastern cottonwood, willow, American elm, and other trees that can tolerate wetness are on the bottom lands. Green ash, black walnut, boxelder, honeylocust, and silver maple are the important species in the wooded drainageways and on the adjacent lower slopes. The wooded areas of uplands are made up of green ash, bur oak, black locust, Siberian elm, and a few other species that do well on soil that is not subirrigated. Although numerous species of trees are in the county, only a few currently have value for commercial wood products. These are black walnut, eastern cottonwood, green ash, bur oak, and silver maple.

Windbreaks and environmental plantings

By Keith Ticknor, forester, Soil Conservation Service.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and

gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and conif-. erous trees and shrubs provide the most protection (fig. 17).

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock

Figure 17.—This new windbreak consists of coniferous and broad-leaved trees and shrubs. It takes in areas of Moody, Nora, and Crofton soils.

of suitable species should be planted properly on a well prepared site and maintained in good condition.

Many of the farmsteads in Colfax County are surrounded by trees that have been planted at various times since the farmstead was established.

In order for windbreaks to fulfill their intended purpose, the trees or shrubs selected should be suited to the soil on which they are planted. Selecting suitable species helps to ensure maximum survival and growth rates. Permeability, available water capacity, and fertility are soil characteristics that greatly affect the growth rate.

The conifers—cedar, pine, and spruce—should be a part of most windbreaks in Colfax County. They retain their needles through the winter and make good barriers for snow.

The major concerns in establishing and managing windbreaks are proper site preparation before planting shrubs and seedlings and control of plant competition after windbreaks have been planted. Many of the older windbreaks in the county are made up of short-lived trees such as the Siberian elm that have reached maturity and are now declining. These trees need to be replaced in order to restore the effectiveness of the windbreaks.

Table 7 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 7 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

At the end of each map unit description, the soil in that unit is placed in a windbreak suitability group. Interpretations for each windbreak suitability group in the county are in the technical guide which is available in local offices of the Soil Conservation Service.

Recreation

Prepared by Robert O. Koerner, biologist, Soil Conservation Service.

Two of the most important forms of recreation in Colfax County are hunting and fishing (fig. 18). Deer and waterfowl hunting is especially good along the Platte River. Pheasant and bobwhite quail are hunted mainly in the uplands. Waterfowl can be hunted in the wetland areas, along the Platte River, and in the Whitetail Special Use Area.

Figure 18.—This recreation area is on Steinauer clay loam.

A 70-acre country club in the county has a nine-hole golf course with grass greens.

A church-owned camp takes in 160 acres north of Richland. Most towns in Colfax County have a municipal park for picnicking and swimming.

The Whitetail Special Use Area is maintained by the Nebraska Game and Parks Commission. It has a total of 216 acres available for public use. This includes 185 acres of land and 31 acres of open water. Recreation activities here include water skiing, boating, hiking, and hunting of big game, small game, and waterfowl.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife habitat

By Robert O. Koerner, biologist, Soil Conservation Service.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or

maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and grain sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are orchardgrass, intermediate wheatgrass, smooth brome, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are big and little bluestem, goldenrod, wheatgrass, and sideoats grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, Washington hawthorn, dogwood, eastern cottonwood, and willow. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Peking cotoneaster, buckbrush, aromatic sumac, and wild plum.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. An example of a native coniferous plant is eastern redcedar. Examples of coniferous plants that are commercially available and suited to soils in Colfax County are ponderosa, Scotch, and Austrian pine.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are plum, lilac, Peking cotoneaster, and aromatic sumac.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, prairie cordgrass, rushes, sedges, and reedgrass.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite, quail, ring-necked pheasant, meadowlark, field sparrow, cottontail, skunk, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, cottontail, thrushes, woodpeckers, squirrels, red fox, skunk, raccoon, deer, coyote, and oppossum.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include white-tailed deer, badger, prairie grouse, and meadowlark. The kinds of wildlife and wildlife habitat on the twelve soil associations in Colfax County are discussed in the paragraphs that follow. The associations are described under the heading "General soil map units."

The Nora-Crofton-Moody association and the Moody-Alcester association have a landscape of undulating and rolling hills. The vegetation is primarily cultivated cropland. Scattered clumps of trees and shrubs are along roadsides; and herbaceous vegetation is in the narrow drainageways. These associations provide a good combination of food and cover for pheasant and bobwhite. Trees and shrubs around farmsteads provide protection for pheasant and quail as well as for cottontail, squirrels, and songbirds.

The Moody-Fillmore association, the Belfore association, and the Moody-Thurman association support habitat for openland wildlife such as pheasant and bobwhite, especially near wooded areas. In places, shallow depressions provide habitat for shore birds and

migrating waterfowl as well as for other related wildlife that use wetlands.

The Steinauer-Moody association is a narrow band of rolling to steep land that has short drainageways and dense stands of bur oak. This association is not a large one but is exceptional for wildlife habitat. Attracted to these wooded areas are such animals as white-tailed deer, squirrels, and songbirds and such predator species as fox, coyote, skunk, and raccoon.

The Blendon and Hall associations are used mainly by openland wildlife. The cover is mainly cultivated crops. Shelterbelts and windbreaks provide winter cover for pheasant and bobwhite, and the adjacent cropland provides food.

The Platte-Inavale association supports habitat for woodland and wetland wildlife. White-tailed deer, cottontail, tree squirrels, and songbirds abound in the wooded area along the Platte River. In the wetland areas adjacent to the river, muskrat, mink, shore birds, and waterfowl are common. The wildlife travel to the uplands for food and if pressured by hunters, return to the cover that is along the river.

The Lawet association is a poorly drained area. At certain times of the year, it provides habitat for wetland species such as waterfowl and shore birds. Cropland areas are usually planted to corn, and areas too wet to cultivate are in hayland or pasture. Small rodents provide food for hawks, owls, eagles, and other migrating predators as well as for the terrestrial predators such as fox and coyote.

In the Alda-Ord and the Zook-Shell-Hobbs associations excellent wildlife habitat is along the major drainageways of the bottom lands. Cover types in these associations include native range and pasture and cultivated cropland. Woody species, such as green ash, American plum, eastern redcedar, Russian-olive, common chokecherry, Russian mulberry, common hackberry, and Tatarian honeysuckle grow along the roadsides and in drainageways. The diversity of cover types provides habitat for a variety of wildlife species, such as fox, coyote, jack rabbit, white-tailed deer, squirrels, songbirds, hawks, owls, eagles, skunk, raccoon, and mink, along with muskrat and beaver. Ringnecked pheasant and bobwhite also nest in these areas. Mourning doves can be found throughout the county.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and

without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid

and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 5 feet. For deeper tranches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of

more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan,

large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 17.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 17.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

Physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind

erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on

the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and chemical analyses of selected soils

Samples from soil profiles were collected for physical and chemical analyses by the Soil Conservation Service, Soil Survey Laboratory in Lincoln, Nebraska. Soils of the Belfore, Crofton, Fillmore, Moody, Nora, and Thurman series were sampled in nearby counties. These data are recorded in Soil Survey Investigations Report Number 5 (*5*).

This information helps soil scientists in classifying soils and developing concepts of soil genesis. It is also helpful in estimating available water capacity, susceptibility to soil blowing, fertility, tilth, and other practical aspects of soil management.

Engineering index test data

Table 17 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and their morphology." The soil samples were tested by the Nebraska Department of Roads.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145-73 (AASHTO), D 3282 (ASTM); Unified classification—D 2487-69 (1975) (ASTM); Mechanical analysis—T 88-76I (AASHTO), D2217 (ASTM); Liquid limit—T 89-76I (AASHTO), D 423 (ASTM); Plasticity index—T 90-70 (AASHTO); and Specific gravity—T 100 (AASHTO). The group index number that is a part of the AASHTO classification is computed by the use of the Nebraska modified system.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*7*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning subhumid, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplustolls (*Hapl*, meaning minimal horizonation, plus *ustoll*, the suborder of the Mollisols that have an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Udic Haplustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*4*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*7*). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Alcester series

The Alcester series consists of deep, well drained soils on foot slopes. Permeability is moderate. These soils formed in silty colluvium and alluvium. Slopes range from 2 to 6 percent.

Alcester soils are near Colo, Hobbs, Kezan, Moody, and Nora soils on the landscape. Colo soils are somewhat poorly drained, have generally lower chroma in the control section, and are lower on the landscape than Alcester soils. Hobbs soils are stratified above a depth of 10 inches and are on bottom lands below Alcester soils. Kezan soils are poorly drained and are below Alcester soils. Moody soils have dark surface soil

less than 20 inches thick and are on side slopes of loess uplands above Alcester soils. Nora soils have free carbonates below a depth of about 8 inches, have more clay in the control section, and are on side slopes of loess uplands above Alcester soils.

Typical pedon of Alcester silt loam, 2 to 6 percent slopes, 1,050 feet east and 750 feet south of the northwest corner of sec. 6, T. 20 N., R. 3 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable; neutral; abrupt, smooth boundary.

A12—7 to 17 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to weak fine granular; slightly hard, friable; neutral; clear wavy boundary.

A13—17 to 24 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable; slightly acid; gradual wavy boundary.

B1—24 to 30 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable; medium acid; gradual wavy boundary.

B2—30 to 36 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine subangular blocky structure; slightly hard, friable; slightly acid; gradual wavy boundary.

C—36 to 60 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable; neutral.

The thickness of the solum and the depth to carbonates range from 36 to more than 60 inches. The mollic epipedon ranges from 24 to 50 inches in thickness and extends into the B horizon. Alcester soils have an irregular decrease in organic matter content with depth. Buried A horizons are in some pedons.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is silt loam or light silty clay loam. It ranges from medium acid to neutral. In places, it contains recent overwash that is the same texture but is not as dark.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 through 4 moist) and chroma of 1 through 3 (dry or moist). It is medium acid to neutral.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 6 (4 or 5 moist) and chroma of 2 or 3 (dry or moist). It typically is silty clay loam or silt loam. It ranges from neutral to moderately alkaline.

Alda series

The Alda series consists of soils that are moderately deep to sand and gravel. These soils are somewhat poorly drained. They formed in calcareous, stratified alluvium on bottom lands. Permeability is moderately rapid in the upper part of the profile and very rapid in the underlying coarse sand and gravel. Slopes range from 0 to 1 percent.

Alda soils are near Blendon, Inavale, Platte, and Ord soils on the landscape. Blendon soils are deep and well drained. They are on stream terraces. Inavale soils are deep sandy soils that have a thin surface layer and are slightly higher on the landscape. Platte soils have gravelly sand at a depth of 10 to 20 inches and are lower on the landscape. Ord soils are deep and have fine sand in the lower part of the control section.

Typical pedon of Alda loam, 0 to 1 percent slopes, 1,584 feet south and 100 feet west of the northeast corner of sec. 29, T. 17 N., R. 2 E.

A—0 to 10 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, very friable; strong effervescence; mildly alkaline; abrupt smooth boundary.

C1—10 to 24 inches; very pale brown (10YR 7/3) sandy loam stratified with lenses of very fine sandy loam and loamy fine sand, brown (10YR 5/3) moist; weak fine granular structure; slightly hard, very friable; moderately alkaline; clear smooth boundary.

C2—24 to 36 inches; very pale brown (10YR 8/3) fine sand, pale brown (10YR 6/3) moist; single grain; loose; mildly alkaline; clear wavy boundary.

IIC3—36 to 60 inches; very pale brown (10YR 8/3) coarse sand with about 5 percent gravel, pale brown (10YR 6/3) moist; few coarse faint yellow (10YR 7/6 moist) mottles; single grain; loose; neutral.

The mollic epipedon and the solum range from 10 to 20 inches in thickness. The soil typically is calcareous at the surface, and the depth to free lime ranges from 0 to 15 inches.

The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It typically is loam, but the range in texture includes fine sandy loam. Reaction is neutral or mildly alkaline.

The AC horizon, if present, has properties intermediate between those described for the A horizon and the upper part of the C horizon. It is fine sandy loam or very fine sandy loam with strata of finer and coarser textured material throughout.

The C horizon has hue of 10YR or 2.5Y, value of 4 through 8 (3 through 6 moist), and chroma of 1 through 3 (moist or dry).

The IIC horizon typically is coarse sand, but the range in texture includes sand and gravelly sand. This horizon is below a depth of 20 to 40 inches. Range in color is the same as for the C horizon. Reaction ranges from neutral through moderately alkaline.

Distinct or prominent mottles are in the lower part of the control section in some pedons.

Belfore series

The Belfore series consists of deep, well drained soils on uplands. Permeability is moderately slow. These soils formed in loess. Slopes range from 0 to 2 percent.

Belfore soils are near Alcester, Fillmore, Moody, and Nora soils on the landscape. Alcester soils have a thicker A horizon and less clay in the B horizon and are on slightly concave foot slopes. Fillmore soils have an A2 horizon and are in shallow depressions. Moody and Nora soils have less clay in the B horizon.

Typical pedon of Belfore silty clay loam, 0 to 2 percent slopes, 1,700 feet west and 100 feet south of the northeast corner of sec. 32, T. 20 N., R. 2 E.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, firm; medium acid; abrupt smooth boundary.

A12—6 to 16 inches; dark gray (10YR 4/1) silty clay loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; hard, firm; medium acid; clear wavy boundary.

B21t—16 to 20 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm; slightly acid; clear wavy boundary.

B22t—20 to 28 inches; pale brown (10YR 6/3) silty clay loam, grayish brown (10YR 5/2) moist; strong medium prismatic structure parting to strong medium and fine subangular blocky; hard, firm; slightly acid; clear wavy boundary.

B23—28 to 36 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; strong coarse prismatic structure parting to strong coarse subangular blocky; hard, firm; slightly acid; clear wavy boundary.

B3—36 to 43 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, firm; slightly acid; clear wavy boundary.

C1—43 to 60 inches; very pale brown (10YR 7/3) silty clay loam, yellowish brown (10YR 5/4) moist; massive; hard, firm; slightly acid.

Free carbonates are leached to a depth of more than 50 inches. The mollic epipedon ranges from 10 to 18 inches in thickness.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). This horizon is medium or slightly acid.

The B2t horizon has value of 4 through 6 (3 through 5 moist) and chroma of 2 or 3 (dry or moist). It is silty clay loam or silty clay that is between 35 and 43 percent clay.

The B23 and B3 horizons have value of 4 through 6 (3 through 5 moist) and chroma of 3 or 4 (dry or moist).

The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 through 4 (dry or moist). It is silty clay loam or silt loam and is slightly acid through mildly alkaline.

Some pedons contain mottles below a depth of 25 inches, and some have small very dark brown or black concretions.

In map unit Bf, the mollic epipedon is more than 20 inches thick and, therefore, outside the range defined for the series. This difference, however, does not alter the use or behavior of the soil.

Blendon series

The Blendon series consists of deep, well drained soils on stream terraces and alluvial fans. Permeability is moderately rapid in the solum and rapid in the underlying material. These soils formed in alluvium. Slopes range from 0 to 6 percent.

Blendon soils are near Alda, Lawet, Ord, and Zook soils. Alda soils are somewhat poorly drained, have coarse sand and gravel at a depth of 20 to 40 inches, and are slightly lower on the landscape. Lawet soils are poorly drained, have a high content of carbonates, and are lower on the landscape. Ord soils are somewhat poorly drained, are calcareous at or near the surface, and are lower on the landscape. Zook soils have more clay in the subsoil and are poorly drained and lower on the landscape.

Typical pedon of Blendon fine sandy loam, 0 to 2 percent slopes, 1,975 feet east and 2,500 feet south of the northwest corner of sec. 13, T. 17 N., R. 3 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2 moist; weak fine granular structure; hard, very friable; neutral; abrupt smooth boundary.

B2—8 to 22 inches; dark grayish brown (10YR 4/2) fine sandy loam, black (10YR 2/1) moist; weak fine subangular blocky structure; hard, very friable; neutral; gradual wavy boundary.

B3—22 to 34 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable; neutral; gradual wavy boundary.

C1—34 to 41 inches; pale brown (10YR 6/3) loamy sand, dark brown (10YR 3/3) moist; weak coarse prismatic structure; slightly hard, very friable; neutral; gradual wavy boundary.

C2—41 to 54 inches; light gray (10YR 7/2) sand with 3 percent gravel; brown (10YR 5/3) moist; single grain; loose; neutral; gradual wavy boundary.

C3—54 to 60 inches; light gray (10YR 7/2) gravelly sand, brown (10YR 5/3) moist; single grain; loose; neutral.

The mollic epipedon ranges from 20 to 50 inches in thickness and extends into the B horizon. Thickness of the solum typically is 30 to 40 inches but ranges from 24

to 50 inches. Depth to carbonates typically is greater than 60 inches; in some pedons it is as little as 40 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It typically is fine sandy loam, but in some pedons it is loam or sandy loam. Reaction ranges from neutral through medium acid.

The B2 horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is fine sandy loam, sandy loam, or loam. Reaction is slightly acid or neutral.

The B3 horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3 (dry or moist). It is fine sandy loam or sandy loam and is slightly acid or neutral.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (3 through 5 moist), and chroma of 2 through 4 (dry or moist). The upper part of this horizon typically is loamy fine sand or loamy sand, but in some pedons it is sandy loam or fine sandy loam. The lower part is gravelly sand or sand. Reaction ranges from neutral to moderately alkaline.

Boel series

The Boel series consists of deep, rapidly permeable, somewhat poorly drained soils on bottom lands of the Platte River Valley. These soils formed in recent loamy and sandy alluvium. Slopes range from 0 to 2 percent.

Boel soils are near Alda, Inavale, Ord, and Platte soils. Alda soils have gravelly sand between depths of 20 and 40 inches and are at a slightly lower elevation. Inavale soils do not have a mollic epipedon, are excessively drained, and are at a higher elevation. Ord soils have less sand in the upper part of the control section and are at about the same elevation. Platte soils have coarse sand or gravelly sand between depths of 10 and 20 inches and are at a lower elevation.

Typical pedon of Boel fine sandy loam, 0 to 2 percent slopes, 1,584 feet east and 1,320 feet south of the northwest corner of sec. 3, T. 16 N., R. 2 E.

A11—0 to 6 inches; dark gray (10YR 4/1) fine sandy loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

A12—6 to 10 inches; dark gray (10YR 4/1) fine sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; mildly alkaline; abrupt smooth boundary.

AC—10 to 14 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; moderately alkaline; abrupt smooth boundary.

C1—14 to 34 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; single grain; loose; thinly stratified with lenses of loamy sand; mildly alkaline; clear wavy boundary.

C2—34 to 60 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; many coarse prominent reddish brown (5YR 4/4 moist) mottles; single grain; loose; moderately alkaline.

The solum is 10 to 20 inches thick. In places, carbonates are present throughout the A horizon. In some profiles the AC horizon is calcareous.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It typically is fine sandy loam and less commonly loam or silt loam. Reaction ranges from neutral through moderately alkaline.

The AC horizon has value of 3 through 5 (2 or 3 moist) and chroma of 2 (dry or moist). It is fine sandy loam or loamy sand. Reaction is neutral through moderately alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 6 through 8 (5 through 7 moist), and chroma of 2 or 3 (dry or moist). It typically is fine sand, but the range in texture includes loamy fine sand and coarse sand. Reaction ranges from neutral through moderately alkaline. This horizon typically is stratified with lenses of lighter or darker material, which may also be coarser or slightly finer in texture.

Colo series

The Colo series consists of deep, somewhat poorly drained soils on bottom lands. Permeability is moderately slow. Colo soils formed in noncalcareous, silty alluvium. Slopes range from 0 to 2 percent.

Colo soils are near Shell and Zook soils on the landscape. The well drained Shell soils have less clay in the control section and are on stream terraces and foot slopes above Colo soils. Zook soils have more clay in the control section and are at a slightly lower elevation.

Typical pedon of Colo silty clay loam, 0 to 2 percent slopes, 800 feet west and 100 feet north of the southeast corner of sec. 2, T. 19 N., R. 3 E.

Ap—0 to 6 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, friable; neutral; abrupt smooth boundary.

A12—6 to 13 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; strong medium and fine subangular blocky structure; hard, friable; neutral; gradual smooth boundary.

A13—13 to 24 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium and fine subangular blocky structure; hard, friable; neutral; gradual smooth boundary.

AC—24 to 37 inches; gray (10YR 5/1) silty clay loam, black (10YR 2/1) moist; moderate prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm; neutral; gradual smooth boundary.

C—37 to 60 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; few fine faint yellowish

brown (10YR 5/4 moist) mottles; massive; hard, firm; neutral.

The solum is 36 to 50 inches thick. The mollic epipedon is 36 to 60 inches thick. Carbonates are absent in the solum and commonly to a depth of 60 inches. Reaction is slightly acid or neutral throughout the profile. In some pedons, stratified dark gray, dark grayish brown, or grayish brown silty overwash sediments 6 to 18 inches thick cover the original A horizon.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 0 or 1 (dry or moist). The AC horizon is absent in some areas. Value of 3 or 4 extends to depths of 36 inches or more; however, a value of 5 and chroma of 0 or 1 are common below the A horizon. The content of clay averages between 30 and 35 percent in the control section. The C horizon has mottles that range from faint to distinct. In places, there are a few fine soft accumulations of iron and manganese.

Crofton series

The Crofton series consists of deep, well drained and somewhat excessively drained soils on uplands. These soils formed in silty loess. Permeability is moderate. Slopes range from 2 to 30 percent.

Crofton soils are near Moody, Alcester, and Nora soils on the landscape. Moody soils have a darker A horizon, have free carbonates lower in the profile, and are above Crofton soils on the landscape. Alcester soils have a thicker and darker A horizon, have lime below a depth of 36 inches, and are on foot slopes. Nora soils have a darker A horizon and carbonates at lower levels in the profile and are on similar positions on the landscape.

Typical pedon of Crofton silt loam, 6 to 11 percent slopes, eroded, 100 feet west and 525 feet north of the southeast corner of sec. 5, T. 20 N., R. 4 E.

Ap—0 to 5 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; hard, friable; a few small concretions of lime; violent effervescence; mildly alkaline; abrupt smooth boundary.

AC—5 to 14 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to weak fine subangular blocky; hard, friable; many concretions of lime and iron oxide; violent effervescence; mildly alkaline; clear wavy boundary.

C1—14 to 32 inches; light gray (10YR 7/2) silt loam, pale brown (10YR 6/3) moist; many coarse faint reddish brown (5YR 4/3 moist) mottles; massive; hard, friable; few concretions of lime and iron oxide; violent effervescence; moderately alkaline; gradual wavy boundary.

C2—32 to 60 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; many coarse prominent reddish brown (5YR 4/3 moist) mottles; massive; hard; few concretions of iron oxide; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 6 to 15 inches, and the depth to free carbonates ranges from 0 to 8 inches.

The A horizon has hue of 10YR, value of 4 through 6 (3 or 4 moist), and chroma of 2 or 3 (dry or moist). Reaction is mildly or moderately alkaline.

The AC horizon is absent in some pedons.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 through 6 moist), and chroma of 2 through 4 (dry or moist).

Few to many small or medium lime concretions are common in all horizons of most pedons. Some pedons contain gray relict mottles in the C horizon.

Eudora series

The Eudora series consists of deep, well drained, moderately permeable soils on high bottom lands of the Platte River Valley. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Eudora soils occur near Alda, Inavale, Ord, and Platte soils on the landsape. Alda soils are moderately deep over coarse sand and gravel, are somewhat poorly drained, and are at a lower elevation. Inavale soils have a thinner A horizon, have more sand in the control section, and are at about the same elevation. Ord soils have more sand in the control section, are somewhat poorly drained, and are at a slightly lower elevation. Platte soils have coarse sand or sand and gravel at a depth of 10 to 20 inches and are at a lower elevation than Eudora soils.

Typical pedon of Eudora loam, sandy substratum, 0 to 2 percent slopes, 100 feet east and 200 feet north of the southwest corner of sec. 31, T. 17 N., R. 3 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—7 to 16 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable; slightly acid; clear wavy boundary.

C1—16 to 27 inches; pale brown (10YR 6/3) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.

C2—27 to 37 inches; light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; violent effervescence; moderately alkaline; clear wavy boundary.

C3—37 to 53 inches; light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist;

massive; slightly hard, very friable; thinly stratified; neutral; abrupt smooth boundary.

C4—53 to 60 inches; light gray (10YR 7/2) loamy fine sand, grayish brown (10YR 5/2) moist; single grain; loose; mildly alkaline.

The mollic epipedon ranges from 7 to 20 inches in thickness, and the solum ranges from 15 to 30 inches. The depth to carbonates averages about 30 inches, but ranges from 14 to 48 inches.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It typically is loam, but in some places it is silt loam or very fine sandy loam. Reaction is slightly acid or neutral.

The C horizon has value of 5 through 7 (4 or 5 moist) and chroma of 2 or 3 (dry or moist). The upper part typically is very fine sandy loam, but the range includes silt loam. The lower part typically is loamy fine sand; in places, it is very fine sandy loam to a depth below 60 inches. Reaction is neutral through moderately alkaline.

Buried soils are at a depth of more than 40 inches in some pedons.

Fillmore series

The Fillmore series consists of deep, poorly drained and very poorly drained soils in shallow depressions on the loess uplands and stream terraces. Permeability is very slow. Slopes range from 0 to 1 percent.

Fillmore soils are near Belfore and Moody soils on the landscape. Belfore and Moody soils do not have an A2 horizon, contain less clay in the subsoil, and are on higher parts of the landscape.

Typical pedon of Fillmore silt loam, 0 to 1 percent slopes, 1,056 feet north and 528 feet east of the southwest corner of sec. 22, T. 18 N., R. 4 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A12—6 to 11 inches; gray (10YR 5/1) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A2—11 to 19 inches; light gray (10YR 6/1) silt loam, gray (10YR 5/1) moist; weak fine granular structure; soft, friable; medium acid; abrupt smooth boundary.

B21t—19 to 32 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to moderate medium angular blocky; very hard, very firm; slightly acid; clear wavy boundary.

B22t—32 to 45 inches; dark gray (10YR 4/1) silty clay, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate fine angular blocky; very hard, very firm; slightly acid; clear wavy boundary.

B3—45 to 52 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; massive; hard, firm; slightly acid; abrupt smooth boundary.

C—52 to 60 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; many medium prominent yellowish red (5YR 4/8 moist) mottles; massive; hard, firm; neutral.

The thickness of the solum ranges from 30 to 70 inches. Depth to free carbonates ranges from 45 to more than 60 inches.

The A1 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 3 (dry or moist). It typically is silt loam and less commonly silty clay loam. Reaction is slightly or medium acid.

The A2 horizon has hue of 10YR, value of 5 through 7 (4 or 5 moist) and chroma of 1 (dry or moist). It is slightly or medium acid.

The B2t horizon has value of 3 through 5 (2 through 4 moist) and chroma of 1 or 2 (dry or moist). It is silty clay or clay, averaging 40 to 55 percent clay. Reaction is slightly acid through mildly alkaline.

The B3 horizon has hue of 10YR or 2.5Y, value of 4 through 6 (2 through 5 moist), and chroma of 2 or 3 (dry or moist). Reaction is slightly acid through mildly alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 through 6 moist) and chroma of 2 through 4 (dry or moist). It typically is silty clay loam, but some pedons are silt loam or silty clay. Reaction is neutral or mildly alkaline.

Gayville Variant

The Gayville Variant consists of deep, moderately well drained, saline-alkali soils on nearly level stream terraces. Permeability is very slow. Slopes range from 0 to 2 percent.

Gayville Variant soils are near the terrace phase of the Belfore soils and near the Alcester, Fillmore, Moody, and Zook soils on the landscape. Alcester soils have less clay in the control section and are on foot slopes. The Belfore soils contain less clay in the subsoil and are at about the same elevation. Fillmore soils have an A2 horizon, are in shallow depressions, and are at a slightly lower elevation. Moody soils contain less clay in the control section and are on uplands. Zook soils are poorly drained and are on bottom lands.

The soils of the Gayville Variant do not have the high water table that is typical of soils of the Gayville series.

Typical pedon of Gayville Variant silty clay loam, 0 to 2 percent slopes, 500 feet west and 50 feet north of the southeast corner of sec. 7, T. 18 N., R. 4 E.

Ap—0 to 8 inches; gray (10YR 5/1) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse granular structure; very hard, very firm; neutral; abrupt smooth boundary.

B21t—8 to 16 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; very hard, very firm; sodium absorption ratio of 12; mildly alkaline; clear wavy boundary.

B22t—16 to 22 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to strong medium and fine subangular blocky; very hard, very firm; many nests of white salt crystals; sodium absorption ratio of 13; mildly alkaline; abrupt smooth boundary.

B23t—22 to 30 inches; brown (10YR 5/3) silty clay, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; very hard, very firm; few nests of white salt crystals; sodium absorption ratio of 20; moderately alkaline; abrupt smooth boundary.

B3—30 to 43 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, firm; sodium absorption ratio of 26; slight effervescence; moderately alkaline; clear wavy boundary.

C1—43 to 60 inches; pale brown (10YR 6/3) silty clay loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable; sodium absorption ratio of 23; slight effervescence; strongly alkaline.

The thickness of the solum ranges from 25 to 50 inches. The depth to carbonates ranges from 20 to 40 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). Typically, it is silty clay loam; less commonly, it is light silty clay. Reaction is neutral through moderately alkaline.

The B2t horizon has hue of 10YR or 2.5Y, value of 3 through 5 (2 to 4 moist), and chroma of 2 or 3 (dry or moist). It typically is silty clay or heavy silty clay loam. Reaction ranges from mildly alkaline or moderately alkaline.

The B3 horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 or 5 moist), and chroma of 3 or 4 (dry or moist). Typically, it is silty clay loam; less commonly, it is silt loam. It is moderately or strongly alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 or 5 moist), and chroma of 3 or 4 (dry or moist). It typically is silty clay loam, but the range in texture includes silt loam. It is moderately or strongly alkaline.

Geary Variant

The Geary Variant consists of deep, well drained soils on uplands. These soils formed in brown and light brown loess of the Loveland Formation. Permeability is moderately slow. Slopes range from 6 to 30 percent.

Geary Variant soils are near Crofton, Moody, Nora, and Steinauer soils on the landscape. Crofton soils do not have a B horizon or a mollic epipedon and are above Geary Variant soils on the landscape. Moody soils formed in younger loess, do not have hue as red as 7.5YR, and are above Geary Variant soils on the landscape. Nora soils have lime higher in the profile, do not have hue as red as 7.5YR, and are above Geary Variant soils on the landscape. Steinauer soils have a thinner solum, formed in glacial till, and generally are below Geary Variant soils on the landscape.

Typical pedon of Geary Variant silty clay loam, 6 to 11 percent slopes, eroded, 1,584 feet east and 1,056 feet south of the northwest corner of sec. 3, T. 18 N., R. 2 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 3/3) moist; weak fine granular structure; hard, friable; slightly acid; abrupt smooth boundary.

B1—6 to 13 inches; yellowish brown (10YR 5/4) silty clay loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, friable; neutral; abrupt smooth boundary.

B21—13 to 22 inches; brown (7.5YR 5/4) silty clay loam, dark brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable; strong effervescence; mildly alkaline; gradual wavy boundary.

B22—22 to 39 inches; light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 5/4) moist; strong coarse prismatic structure parting to strong coarse and medium subangular blocky; hard, friable; strong effervescence; mildly alkaline; gradual wavy boundary.

C—39 to 60 inches; light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 5/4) moist; massive; hard, friable; slight effervescence; mildly alkaline.

The solum ranges from about 30 to 40 inches in thickness. Free carbonates typically are at a depth of 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3 (dry or moist). It typically is silty clay loam, but the range includes loam and silt loam.

The B horizon has hue of 10YR or 7.5YR, value of 5 or 6 (3 through 5 moist), and chroma of 3 through 6 (dry or moist). It typically is silty clay loam, averaging 30 to 35 percent clay.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6 (4 or 5 moist), and chroma of 3 through 6 (dry or moist).

Hall series

The Hall series consists of deep, well drained soils on stream terraces of the Platte River Valley. Permeability is

moderate in the upper part of the profile and rapid in the lower part. These soils formed in a mixture of silty loess, colluvium, and alluvium that overlies loamy and sandy alluvium. Slopes range from 0 to 1 percent.

Hall soils are near Shell and Blendon soils on the landscape. Shell soils do not have an argillic horizon and are on bottom lands. Blendon soils have more sand in the B horizon and are on stream terraces and breaks between the terraces and bottom lands.

Typical pedon of Hall silty clay loam, sandy substratum, 0 to 1 percent slopes, 1,400 feet east and 100 feet south of the northwest corner of sec. 16, T. 17 N., R. 2 E.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, friable; slightly acid; abrupt smooth boundary.

A12—7 to 16 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure; hard, friable; slightly acid; gradual wavy boundary.

B21t—16 to 24 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; hard, friable; neutral; gradual wavy boundary.

B22t—24 to 32 inches; dark brown (10YR 4/3) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine subangular blocky structure; hard, friable; neutral; abrupt smooth boundary.

B3—32 to 38 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; hard, friable; neutral; abrupt smooth boundary.

IIC1—38 to 45 inches; yellowish brown (10YR 5/4) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable; neutral; gradual smooth boundary.

IIC2—45 to 60 inches; yellowish brown (10YR 5/4) loamy sand, brown (10YR 4/3) moist; single grain; loose; neutral.

The thickness of the solum ranges from 27 to 50 inches. The mollic epipedon is 20 to 32 inches thick and extends into the upper part of the B horizon.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It typically is silty clay loam, but in places it is silt loam. Reaction is slightly acid or neutral.

The B2t horizon has value of 3 through 6 (3 or 4 moist) and chroma of 1 through 3 (dry or moist). It is silty clay loam, averaging between 30 and 35 percent clay. Reaction ranges from slightly acid through mildly alkaline.

The B3 horizon has value of 5 through 7 (4 through 6 moist) and chroma of 2 or 3 (dry or moist). It typically is silty clay loam, but in places it is sandy clay loam. Reaction is neutral or slightly acid.

The IIC horizon has value of 5 or 6 (4 through 6 moist) and chroma of 2 or 3 (dry or moist). The texture is fine sandy loam in the upper part and loamy sand or fine sand in the lower part. Reaction is neutral or mildly alkaline. Depth to the sandy material dominantly ranges from 40 to 50 inches.

Hobbs series

The Hobbs series consists of deep, well drained, moderately permeable soils on bottom lands of narrow drainageways of the uplands. These soils formed in noncalcareous silty alluvium. Slopes range from 0 to 2 percent.

Hobbs soils are near Colo, Kezan, Shell, and Zook soils on the landscape. Colo soils are somewhat poorly drained and have more clay in the control section. Kezan soils are poorly drained. Shell soils are stratified at lower depths and are on bottom lands above Hobbs soils. Zook soils are poorly drained, have more clay in the control section, and are lower on the landscape.

Typical pedon of Hobbs silt loam, 0 to 2 percent slopes, 800 feet west and 50 feet south of the northeast corner of sec. 3, T. 20 N., R. 4 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

C1—7 to 21 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse granular structure; slightly hard, very friable; thinly stratified; neutral; abrupt smooth boundary.

C2—21 to 34 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, very friable; thinly stratified; slightly acid; clear smooth boundary.

C3—34 to 60 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable; thinly stratified; slightly acid; clear smooth boundary.

Free carbonates are absent in the upper 40 inches, except in some pedons, which have thin layers of recent deposition that are calcareous.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). Typically, this horizon is silt loam; in places, it is silty clay loam. It ranges from slightly acid through mildly alkaline.

The C horizon has value of 4 through 7 (2 through 5 moist) and chroma of 1 through 3 (dry or moist). Thin strata of soil material with different values are common. The C horizon typically is silt loam, but the range includes light silty clay loam. It ranges from slightly acid to mildly alkaline.

Inavale series

The Inavale series consists of deep, somewhat excessively drained, rapidly permeable soils on bottom lands. These soils formed in recent sandy alluvium. Slopes range from 0 to 9 percent.

Inavale soils are near Alda, Platte, and Ord soils on the landscape. Alda soils have stratified coarse sand and gravelly sand at a depth of 20 to 40 inches and are at a slightly lower elevation. Platte soils have coarse sand and gravelly sand at a depth of 10 to 20 inches, are somewhat poorly drained, and are at a slightly lower elevation. Ord soils contain less sand in the upper part of the control section, are somewhat poorly drained, and are at a slightly lower elevation.

Typical pedon of Inavale loamy fine sand, 3 to 9 percent slopes, 1,300 feet west and 600 feet south of the northeast corner of sec. 4, T. 16 N., R. 2 E.

A1—0 to 7 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose; neutral; clear smooth boundary.

AC—7 to 15 inches; light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; neutral; gradual wavy boundary.

C—15 to 60 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; single grain; loose; thin strata of very fine sandy loam; mildly alkaline.

Thickness of the solum ranges from 10 to 20 inches.

The A horizon has value of 4 through 7 (3 through 5 moist) and chroma of 2 or 3 (dry or moist). It typically is loamy fine sand, but the range in texture includes sand, fine sand, and loamy sand. Reaction is neutral or mildly alkaline.

The AC and C horizons have value of 5 through 7 (4 through 6 moist) and chroma of 2 or 3 (dry or moist). These horizons are loamy fine sand, loamy sand, fine sand, or sand. Reaction ranges from neutral through moderately alkaline. Thin strata of finer and coarser textured material are common in the C horizon. In some pedons a few faint mottles are below a depth of 40 inches.

Kezan series

The Kezan series consists of deep, poorly drained soils on narrow bottom lands of upland drainageways. Permeability is moderate. These soils formed in silty alluvial sediments derived from loess. Slopes range from 0 to 2 percent.

Kezan soils are near Colo, Hobbs, Shell, and Zook soils on the landscape. Colo soils have a darker, thicker A horizon and more clay in the control section and are on similar positions on the landscape. Hobbs soils are better drained and are on similar positions on the landscape. Shell soils have a thicker, darker A horizon, are better drained, and are on a slightly higher position on the landscape. Zook soils have a thicker, darker A horizon and more clay in the control section and are on a slightly lower landscape position.

Typical pedon of Kezan silt loam, 0 to 2 percent slopes, 1,162 feet west and 50 feet south of the northeast corner of sec. 4, T. 20 N., R. 3 E.

A1—0 to 10 inches; stratified grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2) moist; moderate medium and fine granular structure; slightly hard, friable; mildly alkaline; abrupt smooth boundary.

C—10 to 60 inches; stratified light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) moist; common medium distinct reddish brown (5YR 4/4 moist) mottles; massive; slightly hard, friable; slight effervescence on small areas; mildly alkaline.

In some pedons, free carbonates are below a depth of 15 inches.

The A horizon has value of 4 through 6 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is neutral or mildly alkaline. Texture is dominantly silt loam, but the range includes silty clay loam.

The C horizon has a hue of 10YR and 2.5Y, value of 4 through 6 (3 or 4 moist), and chroma of 1 or 2 (dry or moist). It typically is stratified with thin lenses of higher or lower value. Texture typically is silt loam, but the range includes silty clay loam. At depths between 10 and 40 inches, the content of clay averages between 22 and 35 percent. This horizon is neutral or mildly alkaline.

In places, an Ab horizon is at a depth below 20 inches. It is neutral or mildly alkaline silt loam or silty clay loam.

Lawet series

The Lawet series consists of deep, poorly drained soils on bottom lands. Permeability is moderately slow. Lawet soils formed in calcareous alluvium. Slopes range from 0 to 2 percent.

Lawet soils are near Blendon, Shell, and Zook soils on the landscape. Blendon soils are noncalcareous and well drained, have more sand in the B horizon, and are higher on the landscape. Shell soils are noncalcareous and well drained, have more silt in the control section, and are higher on the landscape. Zook soils have more clay in the control section, do not have a calcic horizon, and are slightly lower than Lawet soils on the landscape.

Typical pedon of Lawet silty clay loam, 0 to 1 percent slopes, 1,100 feet south and 100 feet east of the northwest corner of sec. 10, T. 17 N., R. 3 E.

Apca—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

A12ca—7 to 18 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak coarse prismatic structure; hard, friable; violent effervescence; moderately alkaline; clear wavy boundary.

A3ca—18 to 24 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; hard, friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

B2ca—24 to 32 inches; gray (10YR 6/1) clay loam, dark gray (10YR 4/1) moist; weak medium and fine subangular blocky structure; hard, firm; violent effervescence; moderately alkaline; clear wavy boundary.

C1g—32 to 48 inches; light gray (10YR 7/1) clay loam, gray (10YR 5/1) moist; massive; hard, firm; violent effervescence; moderately alkaline; clear wavy boundary.

C2—48 to 55 inches; light brownish gray (2.5Y 6/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable; violent effervescence; moderately alkaline; clear wavy boundary.

IIC3—55 to 60 inches; light gray (2.5Y 7/2) fine sand, dark grayish brown (2.5Y 4/2) moist; few medium distinct reddish brown (5YR 5/4 moist) mottles; single grain; loose; violent effervescence; moderately alkaline.

The mollic epipedon ranges from 10 to 24 inches in thickness, and the solum ranges from 16 to 34 inches. Free carbonates typically are throughout the solum and in the upper part of the C horizon. The content of calcium carbonate in the calcic horizon ranges from 15 to 40 percent.

The A horizon has hue of 10YR or 2.5Y, value of 3 through 5 (2 or 3 moist), and chroma of 0 or 1 (dry or moist). It typically is loam or silty clay loam, but the range includes very fine sandy loam and silt loam.

The B horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 0 or 1 (dry or moist). It typically is clay loam, but the range includes sandy clay loam, loam, and very fine sandy loam.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 through 7 (4 through 7 moist), and chroma of 0 through 2 (dry or moist). It typically is clay loam and sandy clay loam, but the range includes loam, sandy loam, and very fine sandy loam.

The IIC horizon of fine sand is absent in some pedons.

Luton series

The Luton series consists of deep, poorly drained soils on bottom lands. Permeability is very slow. These soils formed in clayey alluvium. Slopes range from 0 to 1 percent.

The Luton soils in this survey area are taxadjuncts to the Luton series. They are shallower to lime and have a thinner solum than is defined in the range for the Luton series. In addition, they have a less yellow hue in the B horizon. These differences, however, do not alter the use or behavior of the soils.

Luton soils are near Lawet, Napa, Shell, and Zook soils on the landscape. Lawet soils contain less clay and more calcium carbonate and are at a slightly higher elevation. Napa soils have a natric horizon and are at a similar elevation. Shell soils contain less clay in the control section, are better drained, and are at a higher elevation. Zook soils contain less clay in the control section, are noncalcareous, and are at a similar or slightly higher elevation.

Typical pedon of Luton silty clay, 0 to 1 percent slopes, 50 feet north and 2,630 feet west of the southeast corner of sec. 35, T. 18 N., R. 4 E.

Ap—0 to 6 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate fine granular structure; very hard, very firm, very sticky; mildly alkaline; abrupt smooth boundary.

A12—6 to 15 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; weak coarse prismatic structure parting to weak fine subangular blocky; very hard, very firm, very sticky; mildly alkaline; clear wavy boundary.

B21—15 to 22 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to strong fine and medium subangular blocky; very hard, very firm, very sticky; strong effervescence on small scattered masses; moderately alkaline; abrupt smooth boundary.

B22—22 to 34 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; very hard, very firm, very sticky; violent effervescence; moderately alkaline; clear wavy boundary.

C1—34 to 50 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; few fine faint reddish brown (5YR 5/4 moist) mottles; weak coarse prismatic structure; very hard, very firm, very sticky; many soft masses of carbonates; violent effervescence; moderately alkaline; abrupt smooth boundary.

C2—50 to 60 inches; light gray (10YR 6/1) silty clay, gray (10YR 5/1) moist; massive; very hard, very firm, very sticky; many large masses of carbonates; violent effervescence; moderately alkaline.

The solum ranges from 32 to 42 inches in thickness.

The A horizon has value of 2 through 4 (2 to 3 moist) and chroma of 0 or 1 (dry or moist). The A horizon typically is silty clay, but the range includes clay and silty clay loam.

The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5 (dry or moist), and chroma of 1 or 2 (dry or moist). The content of clay in the B horizon typically ranges between 50 and 60 percent, but in some pedons some layers contain 60 to 70 percent clay.

The C horizon has hue of 10YR, value of 5 or 6 (4 or 5 moist), and chroma of 0 or 1 (dry or moist).

Moody series

The Moody series consists of deep, well drained soils that formed in loess on uplands. These soils have moderately slow permeability. Slopes range from 0 to 11 percent.

Moody soils are near Alcester, Belfore, Crofton, Nora, and Thurman soils on the landscape. Alcester soils contain less clay, have a thicker mollic epipedon, and are on foot slopes below Moody soils. Belfore soils have more clay in the B horizon, have free carbonates at greater depth, and generally are on higher parts of the landscape. Crofton soils do not have a mollic epipedon, have free carbonates at or near the surface, and are on similar parts of the landscape. Nora soils have less clay in the upper part of the B horizon, are calcareous nearer the surface, and are on similar parts of the landscape. Thurman soils contain more sand and less clay than Moody soils and are on undulating or rolling uplands.

Typical pedon of Moody silty clay loam, 2 to 6 percent slopes, 1,800 feet east and 600 feet south of the northwest corner of sec. 11, T. 18 N., R. 4 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, friable; medium acid; abrupt smooth boundary.

B21—7 to 11 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; hard, friable; slightly acid; clear smooth boundary.

B22—11 to 17 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, friable; neutral; clear smooth boundary.

B23—17 to 26 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable; slightly acid; clear smooth boundary.

B3—26 to 36 inches; yellowish brown (10YR 5/4) silty clay loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; hard, friable; neutral; clear smooth boundary.

C1—36 to 49 inches; pale brown (10YR 6/3) silty clay loam, grayish brown (10YR 5/2) moist; massive; hard, friable; neutral; clear smooth boundary.

C2—49 to 60 inches; pale brown (10YR 6/3) silt loam, grayish brown (10YR 5/2) moist; few fine faint reddish brown (5YR 5/4 moist) mottles; massive; slightly hard, friable; neutral.

The mollic epipedon ranges from 10 to 20 inches in thickness and extends into the B horizon. The solum ranges from about 30 to 60 inches in thickness. Free carbonates are at a depth of 36 to 60 inches or more.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 2 (dry or moist). It typically is silty clay loam, but in some pedons it is silt loam. Reaction ranges from medium acid through neutral.

The B21 horizon has value of 3 or 4 (2 or 3 moist) and chroma of 2 or 3 (dry or moist). The rest of the B2 horizon commonly has hue of 10YR or 2.5Y, value of 5 or 6 (3 through 5 moist), and chroma of 2 through 4 (dry or moist). It is slightly acid or neutral.

The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 (5 or 6 moist), and chroma of 2 through 4 (dry or moist). This horizon is silt loam or silty clay loam. Reaction typically is neutral, but in some pedons it is mildly alkaline. This horizon has few to common relict mottles. In some pedons it contains concretions of calcium carbonate.

In map units MoC2 and MoD2 and in the Moody part of map units TmC2 and TmD2, the A horizon is lighter in color and thinner than defined in the range for the Moody series. These differences, however, do not alter the use or behavior of the soil.

Napa series

The Napa series consists of deep, poorly drained, saline-alkali soils on bottom lands of the Platte River Valley. Permeability is very slow. Slopes range from 0 to 1 percent.

Napa soils occur near Lawet, Luton, Shell, and Zook soils on the landscape. The Lawet soils contain less clay in the subsoil, have a calcic horizon, and are at about the same elevation. Luton soils do not have accumulations of salt in the profile and are at about the same elevation. Shell soils are well drained, do not have accumulations of salt, contain less clay in the control section, and are at the slightly higher elevations. Zook soils do not have accumulations of salts and carbonates and are at about the same elevation.

Typical pedon of Napa silt loam in an area of Napa-Luton complex, 0 to 1 percent slopes, 792 feet west and 100 feet north of the southeast corner of sec. 34, T. 18 N., R. 4 E.

A2—0 to 1 inch; gray (10YR 6/1) silt loam, black (10YR 2/1) moist; weak thin platy structure; soft, very friable; moderately alkaline; abrupt smooth boundary.

B21tsa—1 inch to 7 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium

columnar structure; very hard, very firm, very sticky; common fine and medium threads and segregations of salt; moderately alkaline; abrupt smooth boundary.

B22tsa—7 to 16 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; strong medium and fine subangular blocky structure; very hard, very firm, very sticky; common fine and medium threads and segregations of salt; strongly alkaline; abrupt smooth boundary.

B23t—16 to 24 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; moderate medium and fine subangular blocky structure; very hard, very firm, very sticky; strong effervescence; strongly alkaline; clear wavy boundary.

B24t—24 to 36 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky; strong effervescence; strongly alkaline; clear wavy boundary.

C1—36 to 58 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; few fine faint yellowish brown (10YR 5/6 moist) mottles; massive; very hard, very firm, very sticky; few small lime concretions; strong effervescence; moderately alkaline; abrupt smooth boundary.

C2—58 to 60 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; few fine faint yellowish brown (10YR 5/6 moist) mottles; massive; very hard, very firm, very sticky; few small lime concretions; strong effervescence; moderately alkaline.

Depth to carbonates ranges from 5 to 40 inches. Depth to segregations of salt and gypsum ranges from 1/8 inch to 16 inches. Thickness of the mollic epipedon ranges from 18 to 50 inches or more. The soil ranges from mildly to strongly alkaline throughout the profile.

The A2 horizon has value of 5 to 7 (3 or 4 moist) and chroma of 1 (dry or moist).

The B2t horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 or 4 (2 or 3 moist), and chroma of 1 (dry or moist). It is silty clay or clay. It has few or common segregations of salt.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 through 7 (3 through 5 moist), and chroma of 1 through 3 (dry or moist). It is silty clay, clay, or silty clay loam. Mottles are few to many and faint or distinct.

Nora series

The Nora series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in silty loess. Slopes range from 2 to 15 percent.

Nora soils are adjacent to Alcester, Crofton, Geary Variant, Moody, and Steinauer soils on the landscape. Alcester soils have carbonates at a lower depth, have a thicker A horizon, and are on foot slopes below Nora soils. Crofton soils do not have a mollic epipedon, have free carbonates at or near the surface, and are on similar positions on the landscape. Geary soils developed in loess that has a strong brownish or reddish hue and are generally lower in elevation. Moody soils have a thicker solum, are generally free of carbonates, and are above Nora soils. Steinauer soils do not have a B horizon, have carbonates nearer the surface, formed in glacial till, and are below Nora soils.

Typical pedon of Nora silty clay loam, 6 to 11 percent slopes, 1,500 feet west and 1,200 feet north of the southeast corner of sec. 17, R. 20 N., R. 3 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; hard, friable; slightly acid; abrupt smooth boundary.

B21—9 to 16 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; hard, friable; slightly acid; clear wavy boundary.

B22—16 to 20 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, friable; slightly acid; clear wavy boundary.

B3—20 to 27 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; hard, friable; neutral; clear smooth boundary.

C1ca—27 to 46 inches; very pale brown (10YR 7/3) silt loam, light brownish gray (10YR 6/2) moist; many medium distinct reddish brown (5YR 5/4) moist mottles; massive; hard, very friable; few small lime concretions; violent effervescence; moderately alkaline, clear wavy boundary.

C2—46 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; many coarse prominent reddish brown (5YR 5/4 moist) mottles; massive; hard, very friable; few small and medium lime concretions; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 36 inches. The depth to carbonates ranges from 13 to 30 inches. The mollic epipedon ranges from 7 to 20 inches in thickness and extends into the B horizon in some pedons.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 2 (dry or moist). Typically, it is silty clay loam, but the range includes silt loam. Reaction is slightly acid or neutral.

The B horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 3 or 4 (dry or moist). It typically is silty clay loam, but the range includes silt loam. Reaction ranges from slightly acid through mildly alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 through 6 moist), and chroma of 2 through 4 (dry or moist). It typically is silt loam, but in some pedons it is very fine sandy loam or silty clay loam. Reaction is mildly or moderately alkaline.

In map unit NoC2 and in the Nora part of map units NpD2 and NpE2, the A horizon is lighter in color and thinner than defined in the range for the Nora series. These differences, however, do not alter the use or behavior of the soil.

Ord series

The Ord series consists of deep, somewhat poorly drained soils on bottom lands. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. These soils formed in stratified loamy and sandy alluvium. Slopes range from 0 to 2 percent.

Ord soils are near Alda, Boel, Inavale, Lawet, and Platte soils on the landscape. Alda soils have coarse sand and gravelly sand at a depth of 20 to 40 inches and are at a slightly lower elevation. Boel soils have a sandy control section and are at about the same elevation. Inavale soils do not have a mollic epipedon, are better drained, have a sandy control section, and are at a slightly higher elevation. Lawet soils have a fine-loamy control section and are at the same elevation. Platte soils have coarse sand or gravelly sand at a depth of 10 to 20 inches and are at a slightly lower elevation.

Typical pedon of Ord fine sandy loam, 0 to 2 percent slopes, 1,320 feet north and 100 feet east of the southwest corner of sec. 25, T. 17 N., R. 2 E.

A11—0 to 10 inches; dark gray (10YR 4/1) fine sandy loam, very dark gray (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—10 to 16 inches; stratified gray (10YR 5/1) and light gray (10YR 7/2) fine sandy loam, very dark gray (10YR 3/1) and grayish brown (10YR 5/2) moist; weak fine granular structure; slightly hard, very friable; mildly alkaline; gradual wavy boundary.

C1—16 to 31 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; few fine faint dark yellowish brown (10YR 4/4) moist mottles; single grain; slightly hard, very friable; slight effervescence; moderately alkaline; gradual wavy boundary.

C2—31 to 60 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; few fine faint dark yellowish brown (10YR 4/4 moist) mottles; single grain; loose; moderately alkaline.

The mollic epipedon ranges from 10 to 20 inches in thickness. Depth to carbonates ranges from 0 to 40 inches. Depth to fine sand ranges from 20 to 35 inches.

The A horizon has value of 3 through 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It typically is fine sandy loam, but in some areas it is loam and loamy sand.

Some pedons have an AC horizon. This horizon has hue of 2.5Y or 10YR, value of 5 or 6 (4 or 5 moist), and chroma of 2 (dry or moist). In some pedons it contains few faint iron stains or reddish yellow to dark gray moist mottles. It typically is fine sandy loam, but in some pedons it has thin strata of loamy fine sand.

The C1 horizon has hue of 2.5Y or 10YR, value of 5 through 7 (4 or 5 moist), and chroma of 2 (dry or moist). It has common fine or medium distinct grayish brown or reddish brown moist mottles. This horizon is stratified with lenses or layers of sand, fine sand, loamy fine sand, loamy sand, sandy loam, or fine sandy loam.

The C2 horizon has hue of 2.5Y or 10YR, value of 6 through 8 (5 through 8 moist), and chroma of 2 or 3 (dry or moist). It is fine sand, but in some pedons it contains thin strata of finer textured sediments, especially below a depth of 48 inches.

Platte series

The Platte series consists of somewhat poorly drained soils that are shallow over sand and gravel. These soils formed in alluvium on bottom lands of the Platte River Valley. Permeability is moderately rapid or rapid in the upper part of the profile and very rapid in the lower part. Slopes range from 0 to 2 percent.

The Platte soils in this survey area are taxadjuncts to the Platte series. They have an A horizon that is lighter in color than allowed in the definition of the Platte series. This difference, however, does not influence the use or management of the soils.

Platte soils are near Alda, Boel, Eudora, Inavale, and Ord soils on the landscape. Alda soils have coarse sand or gravelly sand at a depth of 20 to 40 inches and are slightly higher on the landscape. Boel soils are deep, have fine sand in most of the control section, and are slightly higher on the landscape. Eudora soils are deep and moderately well drained, have more silt in the control section, and are higher on the landscape. Inavale soils are deep and somewhat excessively drained, have fine sand in most of the control section, and are slightly higher on the landscape. Ord soils are deep, have fine sand in the lower part of the control section, and are slightly higher on the landscape.

Typical pedon of Platte loam, in an area of Platte-Inavale complex, channeled, 2,640 feet south and 1,056 feet west of the northeast corner of sec. 25, T. 17 N., R. 3 E.

A1—0 to 11 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; mildly alkaline; abrupt smooth boundary.

C1—11 to 17 inches; stratified light gray (10YR 7/2) and light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) and dark grayish brown

(10YR 4/2) moist; few fine distinct brownish yellow (10YR 6/6 moist) mottles; single grain; loose; moderately alkaline; abrupt smooth boundary.

IIC2—17 to 60 inches; light gray (10YR 7/2) coarse sand with about 8 percent gravel; very pale brown (10YR 6/3) moist; single grain; loose; moderately alkaline.

The thickness of the solum ranges from 5 to 11 inches and corresponds to the thickness of the A horizon. The depth to coarse sand or gravelly sand ranges from 10 to 20 inches. In places, calcium carbonate is in the A horizon. The Platte soils typically range from neutral to moderately alkaline throughout the profile.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2 (dry or moist). It typically is loam but ranges from clay loam to loamy fine sand.

Some pedons have an AC horizon.

The IIC horizon has hue of 10YR or 2.5Y, value of 6 or 7 (5 or 6 moist), and chroma of 1 through 3 (dry or moist). It typically is coarse sand that is mixed or stratified with gravel. Content of gravel ranges from 5 to 20 percent. Reddish brown or brown mottles are in this horizon in some pedons.

Shell series

The Shell series consists of deep, well drained and moderately well drained soils on high bottom lands of larger drainageways of the uplands. Permeability is moderate. These soils formed in silty, stratified alluvial material. Slopes range from 0 to 2 percent.

Shell soils are near Alcester, Colo, Hobbs, Kezan, Moody, and Nora soils on the landscape. Alcester soils have a B horizon and are on foot slopes above Shell soils. Colo soils are somewhat poorly drained, have generally lower chroma in the control section, and are slightly lower on the landscape than the Shell soils. Hobbs soils are stratified above a depth of 10 inches and are on bottom lands of narrow drainageways of the uplands. Kezan soils are poorly drained and are below Shell soils. Moody soils have free carbonates below a depth of 30 inches, have a B horizon, and are on side slopes of uplands above Shell soils. Nora soils have free carbonates below 8 inches, have more clay in the control section, and are on side slopes of loess uplands above Shell soils.

Typical pedon of Shell silt loam, 0 to 2 percent slopes, 1,320 feet east and 100 feet north of the southwest corner of sec. 36, T. 18 N., R. 3 E.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; hard, very friable; slightly acid; abrupt smooth boundary.

A12—8 to 24 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; hard, very friable; slightly acid; clear wavy boundary.

C1—24 to 33 inches; thin strata of grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) and grayish brown (10YR 5/2) moist; weak medium and fine fragments; hard, very friable; neutral; clear wavy boundary.

C2—33 to 55 inches; thin strata of grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) and grayish brown (10YR 5/2) moist; few fine faint reddish brown (2.5YR 4/4) moist mottles; massive; hard, very friable; neutral; clear wavy boundary.

C3—55 to 60 inches; thin strata of dark grayish brown (10YR 4/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; few fine faint reddish brown (2.5YR 4/4) moist mottles; massive; hard, very friable; slight effervescence; mildly alkaline.

The thickness of the mollic epipedon and the thickness of the solum range from 20 to 36 inches. Free carbonates are absent above a depth of 48 inches. Buried soils are below a depth of 30 inches in some pedons.

The A horizon has value of 4 through 5 (2 or 3 moist) and chroma of 2 or 3 (dry or moist). It typically is silt loam and less commonly loam or silty clay loam. Reaction is slightly acid or neutral.

The C horizon has value of 4 through 6 (3 through 5 moist) and chroma of 2 or 3 (dry or moist). It typically is silt loam, but the range includes loam. Reaction is neutral through mildly alkaline.

Strata varying in color occur above a depth of 40 inches. Some pedons do not have mottles above a depth of 60 inches.

Steinauer series

The Steinauer series consists of deep, well drained soils that formed in glacial till on uplands. Permeability is moderately slow. Slopes range from 6 to 30 percent.

Steinauer soils are associated with Crofton, Geary Variant, and Nora soils on the landscape. Crofton soils have less sand in the control section and formed in loess on uplands. Geary Variant soils have a thicker solum and formed in light brown loess on uplands. Nora soils formed in loess on uplands, are more strongly developed, and have less sand in the control section. These associated soils are above Steinauer soils on the landscape.

Typical pedon of Steinauer clay loam, 11 to 30 percent slopes, eroded, 1,000 feet south and 300 feet east of the northwest corner of sec. 25, T. 18 N., R. 3 E.

Ap—0 to 4 inches; mixed light brownish gray (10YR 6/2) and light gray (10YR 7/2) clay loam, grayish brown

(10YR 5/2) and brown (10YR 5/3) moist; weak fine granular structure; hard, friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

C1—4 to 14 inches; light gray (10YR 7/2) clay loam, pale brown (10YR 6/3) moist; many medium distinct brownish yellow (10YR 6/6) moist mottles; massive, but with medium angular planes of cleavage; hard, friable; many nests of soft calcium carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

C2—14 to 60 inches; light gray (10YR 7/2) clay loam, pale brown (10YR 6/3) moist; common coarse prominent brownish yellow (10YR 6/6) moist mottles; massive, but with large angular planes of cleavage; hard, friable; many nests of soft calcium carbonate; few lime concretions; violent effervescence; moderately alkaline.

The content of pebbles and stones on the surface and in the profile ranges from less than 1 percent to 10 percent by volume. The depth to free carbonates ranges from 0 to about 10 inches.

The A horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 or 3 (dry or moist). It typically is clay loam, but the range includes loam and gravelly clay loam. This horizon is mildly or moderately alkaline.

Some pedons have an AC horizon, which has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 through 4 (dry or moist) and is typically lighter in color than the A horizon.

The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 (5 or 6 moist), and chroma of 2 through 4 (dry or moist). The C horizon typically is clay loam, but in places it contains thin layers of loam and light clay. It also contains seams or pockets of sand and gravel. Stones, pebbles, and concretions of lime and iron vary in size and amount from place to place.

Thurman series

The Thurman series consists of deep, somewhat excessively drained soils on uplands. These soils formed in sandy eolian material. Permeability is rapid. Slopes range from 2 to 11 percent.

The Thurman soils in this survey area are taxadjuncts to the Thurman series. They have a thinner A horizon than is defined in the range for the Thurman series, but this difference does not alter the use or behavior of the soils.

Thurman soils are near Moody soils on the landscape. Moody soils have more silt and clay and less sand in the control section and are generally at the same elevation.

Typical pedon of Thurman loamy fine sand in an area of Thurman-Moody complex, 2 to 6 percent slopes, eroded, 300 feet east and 1,600 feet north of the southwest corner of sec. 28, T. 18 N., R. 2 E.

Ap—0 to 9 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; slightly acid; abrupt smooth boundary.

AC—9 to 15 inches; pale brown (10YR 6/3) loamy fine sand, dark brown (10YR 4/3) moist; single grain; loose; slightly acid; clear smooth boundary.

C—15 to 60 inches; very pale brown (10YR 7/3) fine sand, brown (10YR 5/3) moist; single grain; loose; neutral.

The thickness of the solum ranges from 9 to 20 inches. The soil is slightly acid or neutral throughout.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3 (dry or moist). It typically is loamy fine sand, but in places it is loamy sand.

The AC horizon has value of 4 through 6 (3 or 4 moist) and chroma of 2 or 3. It typically is loamy fine sand, but the range includes fine sand.

The C horizon has value of 5 through 7 (4 or 5 moist) and chroma of 2 through 4 (dry or moist).

A buried soil is at a depth of 40 to 60 inches in some pedons.

Zook series

The Zook series consists of deep, poorly drained soils on the Maple Creek drainageways and the Platte River bottom lands. These soils formed in silty and clayey alluvium. Permeability is slow. Slopes range from 0 to 1 percent.

Zook soils are near Colo, Luton, and Napa soils on the landscape. Colo soils are better drained, have less clay in the control section, and are at a slightly higher elevation. Luton soils have more clay and are at a slightly lower elevation. Napa soils contain more soluble salts and sodium in the control section, have more clay in the subsoil, and are at a similar elevation.

Typical pedon of Zook silty clay loam, 0 to 1 percent slopes, 2,000 feet north and 300 feet east of the southwest corner of sec. 6, T. 20 N., R. 3 E.

Ap—0 to 6 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, firm; slightly acid; abrupt smooth boundary.

A12—6 to 21 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium and fine subangular blocky structure; hard, firm; slightly acid; gradual smooth boundary.

A3—21 to 27 inches; very dark gray (10YR 3/1) silty clay, black (10 YR 2/1) moist; weak medium and fine blocky structure; hard, very firm, sticky; slightly acid; gradual smooth boundary.

B2—27 to 36 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; weak coarse and medium blocky structure; hard, very firm, very sticky; slightly acid; gradual smooth boundary.

C1g—36 to 41 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; massive; hard, very firm, sticky; slightly acid; gradual smooth boundary.

C2g—41 to 60 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; few medium distinct yellowish brown (10YR 5/6 moist) mottles; massive; hard, very firm, sticky; neutral.

Typically, the solum ranges from 36 to 60 inches in thickness. The mollic epipedon ranges from 36 to 50 inches in thickness. Reaction throughout the profile commonly is medium or slightly acid, but neutral or mildly alkaline soils are within the range of the series. Zook soils are noncalcareous to a depth of 50 inches or more.

The A horizon has a value of 3 or 4 (2 or 3 moist) and chroma of 0 to 1 (dry or moist). The A horizon typically is silty clay loam, but in some areas it is silty clay.

The B and Cg horizons contain between 36 and 45 percent clay. They have hue of 10YR, 2.5Y, or 5Y, value of 3 through 5 (2 through 4 moist), and chroma of 1 (dry or moist).

Factors of soil formation

Soil is produced by soil-forming processes that act on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be much or little, but some time is always required for differentiation of soil horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent material

Parent material is the unconsolidated and partly weathered rock in which soil forms. It determines the chemical and mineralogical composition of the soil. The parent materials of the soils in Colfax County are loess, glacial till, alluvium, eolian sand, and colluvium.

Loess is silty wind-deposited material. The soils on uplands formed in loess. The upper part of the loess mantle is of Peoria age; it is friable, massive, yellowish brown or gray and very pale brown silty clay loam. It is calcareous and has a few lime concretions. The loess commonly is 30 to 45 feet thick but in places is as little as a few feet to more than 100 feet thick.

The soils that formed in Peoria loess are in the Fillmore, Belfore, Crofton, Gayville Variant, Moody, and Nora series. Fillmore soils are in shallow depressions. Belfore soils are on nearly level divides; soils of the Gayville Variant are on low, nearly level divides adjacent to streams; and Crofton, Moody, and Nora soils are on ridgetops and side slopes. Soils that formed in Peoria loess make up 54.9 percent of the county.

The Peoria loess is underlain by material of the Loveland Formation. Much of this material is assumed to be of loessial origin. This material is light brown silty clay loam and has slightly more sand than Peoria loess. The Loveland material outcrops mainly on upland side slopes and on the lower part of valley sides and, in places, on ridgetops where erosion is most severe. It is the parent material in which Geary Variant soils formed. Geary Variant soils make up 0.5 percent of the county.

Glacial till—unsorted, nonstratified glacial drift—lies beneath the Peoria and Loveland Formations. It is exposed on some of the side slopes adjacent to major streams and in some of the deep gullies. Glacial till is loamy and contains pebbles, small stones, and pockets of lime. The Steinauer soils formed in this material. These soils make up about 0.9 percent of the county.

Alluvium is material deposited by water on bottom lands and terraces of broad stream valleys or in narrow drainageways on uplands. Alluvium ranges widely in texture because of differences in the materials from which it originated and in the manner in which it was deposited. In Colfax County, the soils that formed in alluvium on stream terraces are in the Belfore and Hall series. Blendon soils, on stream terraces, formed in moderately coarse textured alluvium that has been reworked by wind. The soils that formed in more recent alluvium on bottom lands are in the Alda, Boel, Colo, Eudora, Hobbs, Inavale, Kezan, Lawet, Luton, Napa, Ord, Platte, Shell, and Zook series. Soils that formed in alluvium make up 34.1 percent of the county.

Eolian sand and a small amount of loess are the parent materials of the sandy soils on uplands lying between Shell Creek and the Platte River Valley. This material ranges in thickness from a few feet to many feet. Soils formed in eolian sand are mostly coarse textured and excessively drained. Some side slopes adjacent to major valleys have a few scattered areas of deep sandy material. This material is believed to have been deposited by water. Thurman soils formed mainly in eolian sands. These soils make up about 0.8 percent of the county.

Colluvium is the soil material that accumulates on foot slopes. It was transported only a short distance and deposited by the combined action of gravity and water. It is mostly silt, but also contains some sand and clay. This

material generally is dark colored silt loam. The gently sloping Alcester soils formed in colluvium. These soils make up 8.5 percent of the county.

There are no formations of bedrock exposed at the surface in Colfax County.

Climate

Climate has been important in the formation of soils in Colfax County. It affects soils directly by its influence on parent material and indirectly by its influence on vegetation and micro-organisms.

The climatic factors that affect the weathering of parent material are rainfall, temperature fluctuations, and wind. In Colfax County, the average annual precipitation is about 28 inches. This amount of moisture is sufficient to move carbonates from the surface layer to the subsoil, and in some soils, to the upper part of the underlying material. The downward movement of water can also account partly for the increase in clay content in the subsoil of some soils. Fillmore soils, for example, are in depressions where the ponded water has accelerated the leaching process. Rainfall also affects soil formation through its influence on the kind and amount of vegetation that grows.

Alternate freezing and thawing hastens physical disintegration of the parent material. Summer heat and moisture speed chemical weathering. Wind transfers soil material from one place to another, thus slowing the process of soil formation. The extensive deposits of loess in this county are examples of the importance of wind as an agent of deposition of soil material. Drying aids in the development of granular structure in the surface layer. In winter, snow accumulates more on southeast-facing slopes and this results in additional moisture in these areas.

Micro-organisms in the soil are most active within a certain temperature range; thus, the rate at which humus is formed by decomposing organic matter varies. Changes in temperature and moisture activate the weathering of parent material, resulting in chemical and physical changes in the soil.

Because the humidity in Colfax County generally is low, a fairly high loss of water occurs through evaporation and transpiration. The loss of water reduces leaching, growth of vegetation, decomposition of organic matter, and chemical weathering.

Plant and animal life

Plants, animals, micro-organisms, earthworms, and other organisms are active in soil formation. Because trees were present in only a few places in Colfax County, mainly along stream channels, they have had only a slight influence on soil formation.

The soils in Colfax County formed mainly under a mixture of medium and tall grasses. The grasses and their fibrous roots, which penetrate the upper few feet of soil, form the thick dark layer of humus which gives the soils their granular structure and good tilth.

Plant roots bring nutrients to the surface. Calcium, in particular, helps to keep the soils more porous. The decomposition of organic material forms organic acids that in solution hasten the leaching process and thus aid soil formation.

Living organisms are important in soil formation. The action of micro-organisms helps to change undecomposed organic matter to humus. Some bacteria take in nitrogen from the air, and when they die the nitrogen becomes available for plant growth. Other bacteria oxidize sulphur, which then also becomes available for plants. The plants complete the cycle by producing more organic matter. Other living organisms, such as algae, fungi, protozoa, and actinomycetes, affect soil formation physically and chemically. Larger animals such as gophers, moles, earthworms, millepedes, spiders, and insects aid in mixing the soil and contribute to its organic matter content when they die.

Human activities also affect soil formation. Conservation tillage practices and terraces help to build and improve the soil. Fertilization and irrigation change the soil. Likewise, cultivation can contribute to soil loss unless care is taken to conserve the soils. The activities of man have immediate effects on both the rate and direction of soil-forming processes.

Relief

Relief affects soil formation mainly through its influence on runoff, erosion, aeration, and drainage. On steep and very steep slopes runoff is more rapid than on milder slopes. Consequently, plant growth generally is less vigorous, less water penetrates the soil, soil horizons are thinner and less distinct, and lime is not so deeply leached. Erosion is more severe on the steeper slopes if all other factors are equal.

Even in soils that have the same parent material, the influence of relief is evident in the color, thickness, and horizonation of the soils. The gradient, shape, length, and direction of slope influence the amount of moisture in the soil. Crofton, Moody, Belfore, and Fillmore soils all formed in Peoria loess and consequently their differences can largely be attributed to differences in relief. Steep and very steep soils, such as Crofton soils, are weakly developed, have a thin surface layer, and have lime at or near the surface. In Moody soils, which are not quite so steep, the surface layer is thicker, lime is leached to a greater depth, and a subsoil has formed. In the nearly level Belfore soils, the surface layer is dark colored and thick, the subsoil is well developed, and lime is leached to a greater depth. Fillmore soils formed in shallow depressions and are more strongly developed than other soils in Colfax County.

Soils such as Alda, Boel, Colo, Eudora, Hobbs, Inavale, Kezan, Lawet, Luton, Napa, Ord, Platte, Shell, and Zook soils are on bottom lands and have low relief.

Soil formation is slow on bottom lands because the soils commonly receive sediment from flooding. Each period of flooding provides new parent material and starts a new cycle of soil formation. An example of a soil that formed on bottom lands and is frequently flooded is Hobbs silt loam, channeled.

Time

The soil-forming factors of relief, climate, and plant and animal life require time to change the parent material into soil. If the parent material has been in place for only a short time, the factors of soil formation will have had little effect on it. The degree of profile development depends on the intensity of the soil-forming factors. Differences in the length of time that geologic materials have been in place are commonly reflected in the distinctness of horizons in the soil profile.

The time required for a soil to form depends mainly on the kind of parent material and the climate. The finer the texture of the parent material, the longer the time needed for soil formation. The finer textures retard the downward movement of water, which is necessary for soil formation. Soils in warm, humid areas form faster than soils in cool, dry areas.

The concept of soil maturity has been explained in terms of time as it relates to the other four soil-forming factors. Soils that do not have a B horizon were once commonly thought to be immature in their stage of formation, and soils that have a well developed B horizon were thought to be mature. However, the maturity of a soil depends on the interaction of all five factors. Thus, a steep Crofton soil that does not have a B horizon might actually have progressed to the limit of formation on its particular slope and in its particular climate. If expanding lattice clays are present, peds can form in very young material even if little organic matter is present.

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glossary

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves all or part of the crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth, classes. The total thickness of soil material over mixed sand and gravel is expressed as follows: *very shallow,* 0 to 10 inches; *shallow,* 10 to 20 inches; *moderately deep,* 20 to 40 inches; and *deep,* more than 40 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another

within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Organic matter content. The amount of organic matter in soil material. The classes used in this survey are *very low,* less than 0.5 percent organic matter present; *low,* 0.5 to 1.0 percent; *moderately low,* 1.0 to 2.0 percent; *moderate,* 2.0 to 4.0 percent; and *high,* 4.0 to 8.0 percent.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline-alkali soil. A soil that contains a harmful concentration of salts and exchangeable sodium; contains harmful salts and is strongly alkaline; or contains harmful salts and exchangeable sodium and is very strongly alkaline. The salts, exchangeable sodium, and alkaline reaction are in the soil in such location that growth of most crop plants is less than normal.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

In this survey area, the classes of slope are:

nearly level	0 to 2 percent
gently sloping	2 to 6 percent
strongly sloping	6 to 11 percent
moderately steep	11 to 15 percent
steep	15 to 30 percent

Slow intake (in tables). The slow movement of water into the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stratified. Arranged in strata or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, A2, or A3) below the surface layer.

Surface soil. The A horizon. Includes all subdivisions of this horizon (A, A2, and A3)

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and

are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well-graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-77 at Clarkson, Nebraska]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	30.9	8.7	19.8	58	-22	0	.69	.20	1.09	2	6.7
February---	37.9	15.3	26.6	67	-14	0	.99	.23	1.57	3	4.1
March------	46.7	23.8	35.3	79	-4	38	1.71	.63	2.57	4	5.3
April------	63.2	36.8	50.0	89	15	102	2.47	1.06	3.62	5	1.1
May--------	74.5	48.7	61.6	94	27	368	4.41	2.33	6.11	7	.0
June-------	83.7	58.4	71.0	100	39	630	4.35	2.31	6.02	7	.0
July-------	88.2	63.2	75.7	103	46	797	3.55	1.46	5.24	5	.0
August-----	85.8	60.9	73.4	100	44	725	3.50	1.79	4.90	6	.0
September--	76.3	50.7	63.5	95	28	405	2.77	1.01	4.18	5	.0
October----	66.8	39.4	53.1	90	19	180	1.88	.31	3.12	4	.2
November---	49.2	25.6	37.4	73	1	7	.98	.12	1.62	2	2.5
December---	36.4	14.7	25.6	63	-17	0	.76	.22	1.18	2	4.6
Yearly:											
Average--	61.6	37.2	49.4	---	---	---	---	---	---	---	---
Extreme--	---	---	---	103	-24	---	---	---	---	---	---
Total----	---	---	---	---	---	3,252	28.06	22.45	33.39	52	24.5

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-77 at Clarkson, Nebraska]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 25	May 15	May 18
2 years in 10 later than--	April 21	May 10	May 13
5 years in 10 later than--	April 13	April 29	May 2
First freezing temperature in fall:			
1 year in 10 earlier than--	October 11	September 25	September 16
2 years in 10 earlier than--	October 15	September 30	September 21
5 years in 10 earlier than--	October 23	October 11	October 1

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-77 at Clarkson, Nebraska]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	177	144	131
8 years in 10	182	151	138
5 years in 10	192	165	151
2 years in 10	202	178	165
1 year in 10	208	185	172

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AcC	Alcester silt loam, 2 to 6 percent slopes	22,200	8.4
Af	Alda fine sandy loam, 0 to 1 percent slopes	1,150	0.4
Ag	Alda loam, 0 to 1 percent slopes	3,400	1.3
Be	Belfore silty clay loam, 0 to 2 percent slopes	4,450	1.7
Bf	Belfore silty clay loam, terrace, 0 to 2 percent slopes	2,900	1.1
Bh	Blendon fine sandy loam, 0 to 2 percent slopes	7,600	2.9
BnC	Blendon loam, 2 to 6 percent slopes	330	0.1
Bo	Boel fine sandy loam, 0 to 2 percent slopes	2,550	1.0
Cg	Colo silty clay loam, 0 to 2 percent slopes	2,700	1.0
CrC2	Crofton silt loam, 2 to 6 percent slopes, eroded	1,600	0.6
CrD2	Crofton silt loam, 6 to 11 percent slopes, eroded	2,200	0.8
CrE2	Crofton silt loam, 11 to 15 percent slopes, eroded	1,950	0.7
CrF2	Crofton silt loam, 15 to 30 percent slopes, eroded	1,700	0.6
Ed	Eudora loam, sandy substratum, 0 to 2 percent slopes	560	0.2
Fm	Fillmore silt loam, 0 to 1 percent slopes	2,200	0.8
Fp	Fillmore silt loam, ponded, 0 to 1 percent slopes	200	0.1
Gc	Gayville Variant silty clay loam, 0 to 2 percent slopes	570	0.2
GvD2	Geary Variant silty clay loam, 6 to 11 percent slopes, eroded	650	0.2
GvF2	Geary Variant silty clay loam, 11 to 30 percent slopes, eroded	530	0.2
Ha	Hall silty clay loam, sandy substratum, 0 to 1 percent slopes	2,100	0.8
Hb	Hobbs silt loam, 0 to 2 percent slopes	7,300	2.8
Hf	Hobbs silt loam, channeled	1,400	0.5
InB	Inavale loamy fine sand, 0 to 3 percent slopes	800	0.3
InD	Inavale loamy fine sand, 3 to 9 percent slopes	2,050	0.8
Kz	Kezan silt loam, 0 to 2 percent slopes	2,800	1.1
Lc	Lawet silt loam, 0 to 1 percent slopes	5,700	2.2
Ld	Lawet silty clay loam, 0 to 1 percent slopes	4,500	1.7
Lu	Luton silty clay, 0 to 1 percent slopes	1,800	0.7
Mo	Moody silty clay loam, 0 to 2 percent slopes	8,400	3.2
MoC	Moody silty clay loam, 2 to 6 percent slopes	28,800	11.0
MoC2	Moody silty clay loam, 2 to 6 percent slopes, eroded	10,600	4.0
MoD	Moody silty clay loam, 6 to 11 percent slopes	2,850	1.1
MoD2	Moody silty clay loam, 6 to 11 percent slopes, eroded	12,300	4.7
Na	Napa-Luton complex, 0 to 1 percent slopes	1,800	0.7
NoC	Nora silty clay loam, 2 to 6 percent slopes	350	0.1
NoC2	Nora silty clay loam, 2 to 6 percent slopes, eroded	2,150	0.8
NoD	Nora silty clay loam, 6 to 11 percent slopes	1,350	0.5
NoE	Nora silty clay loam, 11 to 15 percent slopes	690	0.3
NpD2	Nora-Crofton complex, 6 to 11 percent slopes, eroded	44,700	17.0
NpE2	Nora-Crofton complex, 11 to 15 percent slopes, eroded	15,400	5.9
Of	Ord fine sandy loam, 0 to 2 percent slopes	5,000	1.9
Pb	Pits and dumps	540	0.2
Pc	Platte loam, 0 to 2 percent slopes	660	0.3
Px	Platte-Inavale complex, channeled	3,250	1.2
So	Shell silt loam, occasionally flooded, 0 to 2 percent slopes	13,000	4.9
Sp	Shell silt loam, clayey substratum, 0 to 2 percent slopes	2,350	0.9
StD2	Steinauer clay loam, 6 to 11 percent slopes, eroded	690	0.3
StF2	Steinauer clay loam, 11 to 30 percent slopes, eroded	1,650	0.6
TmC2	Thurman-Moody complex, 2 to 6 percent slopes, eroded	830	0.3
TmD2	Thurman-Moody complex, 6 to 11 percent slopes, eroded	1,300	0.5
Zo	Zook silty clay loam, 0 to 1 percent slopes	13,100	5.0
	Water areas less than 40 acres	190	0.1
	Water areas greater than 40 acres	3,360	1.3
	Total	263,200	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn		Soybeans		Alfalfa hay		Winter wheat		Grain sorghum		Cool-season grass	
	N	I	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Ton	Ton	Bu	Bu	Bu	Bu	AUM*	AUM*
AcC: Alcester	82	125	33	40	3.9	5.7	38	---	80	---	6	13
Af: Alda	55	125	28	38	2.8	4.5	28	---	65	---	5	11
Ag: Alda	60	128	32	41	3.0	4.8	30	---	69	---	5	11
Be: Belfore	80	133	33	40	3.9	6.0	33	---	85	---	5	12
Bf: Belfore	89	135	36	42	4.2	6.0	35	---	87	---	5	12
Bh: Blendon	62	130	24	38	2.7	5.0	36	---	60	---	5	13
BnC: Blendon	55	110	20	32	2.6	4.5	30	---	56	---	4	13
Bo: Boel	50	110	28	38	3.0	4.5	30	---	55	---	4	10
Cg: Colo	85	149	35	42	4.5	6.0	36	---	85	---	6	13
CrC2: Crofton	62	100	25	30	2.8	4.4	28	---	60	---	4	10
CrD2: Crofton	58	90	21	---	2.3	4.0	25	---	58	---	4	10
CrE2: Crofton	50	---	17	---	2.0	---	21	---	50	---	4	---
CrF2: Crofton	---	---	---	---	---	---	---	---	---	---	---	---
Ed: Eudora	70	145	35	42	3.6	6.0	38	---	80	---	5	13
Fm: Fillmore	50	85	28	35	2.1	---	25	---	60	---	5	11
Fp: Fillmore	---	---	---	---	---	---	18	---	---	---	---	---
Gc: Gayville Variant	35	60	---	---	1.5	2.0	20	---	55	---	5	9
GvD2: Geary Variant	44	---	23	---	2.8	---	28	---	53	---	4	11
GvF2: Geary Variant	---	---	---	---	---	---	---	---	---	---	---	---
Ha: Hall	78	140	30	42	3.5	5.8	38	---	85	---	6	13
Hb: Hobbs	80	135	33	40	4.0	6.0	40	---	90	---	6	13
Hf: Hobbs	---	---	---	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn		Soybeans		Alfalfa hay		Winter wheat		Grain sorghum		Cool-season grass	
	N	I	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Ton	Ton	Bu	Bu	Bu	Bu	AUM*	AUM*
InB---------------------- Inavale	38	95	19	30	2.0	4.1	23	---	40	---	3	10
InD---------------------- Inavale	---	---	---	---	---	---	---	---	---	---	---	---
Kz----------------------- Kezan	40	---	20	---	3.0	---	20	---	35	---	5	---
Lc----------------------- Lawet	70	120	---	---	3.0	4.8	35	---	45	---	6	10
Ld----------------------- Lawet	65	110	---	---	2.8	4.6	30	---	43	---	6	10
Lu----------------------- Luton	60	105	23	32	2.9	---	25	---	66	---	4	11
Mo----------------------- Moody	87	140	35	39	4.0	6.0	37	---	85	---	6	13
MoC---------------------- Moody	81	120	31	36	3.9	5.9	35	---	78	---	6	13
MoC2--------------------- Moody	78	116	28	35	3.3	5.4	33	---	73	---	5	13
MoD---------------------- Moody	75	114	27	33	3.6	5.2	34	---	70	---	5	12
MoD2--------------------- Moody	70	108	24	30	3.0	4.8	35	---	65	---	5	12
Na----------------------- Napa-Luton	40	70	18	22	3.0	4.0	20	---	42	---	4	9
NoC---------------------- Nora	78	118	28	35	3.7	5.5	35	---	70	---	6	13
NoC2--------------------- Nora	72	110	25	34	3.4	5.3	32	---	68	---	5	13
NoD---------------------- Nora	70	108	23	---	3.1	4.8	30	---	65	---	5	12
NoE---------------------- Nora	58	---	19	---	2.7	---	28	---	62	---	5	---
NpD2--------------------- Nora-Crofton	65	100	22	---	2.7	4.5	27	---	60	---	5	12
NpE2--------------------- Nora-Crofton	53	---	---	---	2.4	---	24	---	50	---	---	---
Of----------------------- Ord	57	120	25	40	3.4	5.5	30	---	65	---	5	11
Pb. Pits and dumps												
Pc----------------------- Platte	50	85	23	30	---	---	22	---	55	---	5	12
Px----------------------- Platte-Inavale	---	---	---	---	---	---	---	---	---	---	---	---
So----------------------- Shell	88	139	36	44	4.0	6.2	40	---	85	---	6	13

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn		Soybeans		Alfalfa hay		Winter wheat		Grain sorghum		Cool-season grass	
	N	I	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Ton	Ton	Bu	Bu	Bu	Bu	AUM*	AUM*
Sp------------------------ Shell	87	120	32	40	4.0	6.0	36	---	85	---	6	13
StD2---------------------- Steinauer	53	80	21	---	2.6	4.0	24	---	55	---	4	10
StF2---------------------- Steinauer	---	---	---	---	---	---	---	---	---	---	---	---
TmC2---------------------- Thurman-Moody	60	95	20	30	2.6	4.3	27	---	70	---	4	10
TmD2---------------------- Thurman-Moody	55	90	---	---	2.2	4.0	24	---	60	---	4	10
Zo------------------------ Zook	85	120	33	40	4.2	5.9	35	---	80	---	5	11

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[All soils are assigned to nonirrigated capability subclasses (N). Only those potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Dashes mean no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I (N)	18,410	---	---	---
(I)	18,410	---	---	---
II (N)	102,400	51,350	43,450	7,600
(I)	51,050	7,600	43,450	---
III (N)	87,810	76,710	11,100	---
(I)	78,760	67,660	11,100	---
IV (N)	39,910	23,680	13,860	2,370
(I)	80,630	67,400	10,860	2,370
V (N)	---	---	---	---
VI (N)	10,580	5,930	4,650	---
VII (N)	---	---	---	---
VIII(N)	540	---	---	540

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
AcC: Alcester	Lilac	Siberian peashrub, American plum, Tatarian honeysuckle.	Common hackberry, ponderosa pine, blue spruce, bur oak, eastern redcedar, Russian-olive	Green ash, honeylocust.	---
Af, Ag: Alda	Redosier dogwood, lilac.	Common chokecherry, American plum.	Eastern redcedar, common hackberry, midwest Manchurian crabapple.	Austrian pine, green ash, honeylocust, golden willow.	Eastern cottonwood.
Be: Belfore	---	Siberian peashrub, Tatarian honeysuckle, lilac, American plum.	Eastern redcedar, common hackberry, bur oak, Russian-olive, blue spruce.	Ponderosa pine, green ash, honeylocust.	---
Bf: Belfore	---	Lilac, Siberian peashrub, Tatarian honeysuckle, American plum.	Eastern redcedar, Russian-olive, common hackberry, bur oak, blue spruce.	Green ash, honeylocust, ponderosa pine.	---
Bh: Blendon	Skunkbush sumac	Tatarian honeysuckle, Siberian peashrub, lilac, American plum.	Honeylocust, green ash, common hackberry, ponderosa pine, Russian-olive, eastern redcedar.	---	Siberian elm.
BnC: Blendon	Silver buffaloberry, Peking cotoneaster.	Siberian peashrub, lilac, American plum, Tatarian honeysuckle.	Eastern redcedar, ponderosa pine, common hackberry, green ash.	---	---
Bo: Boel	Redosier dogwood, lilac.	Common chokecherry, American plum.	Eastern redcedar, common hackberry, midwest Manchurian crabapple.	Austrian pine, green ash, golden willow, honeylocust.	Eastern cottonwood.
Cg: Colo	Redosier dogwood	Common chokecherry, American plum.	Eastern redcedar, common hackberry.	Silver maple, Austrian pine, golden willow, honeylocust, green ash, northern red oak.	Eastern cottonwood.
CrC2, CrD2, CrE2: Crofton	Silver buffaloberry, American plum.	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, Russian-olive, common hackberry, Tatarian honeysuckle.	Ponderosa pine, honeylocust, Siberian elm, green ash.	---	---
CrF2. Crofton					
Ed: Eudora	Peking cotoneaster	American plum, lilac, Siberian peashrub.	Eastern redcedar, ponderosa pine, Manchurian crabapple.	Honeylocust, green ash, common hackberry, golden willow.	Eastern cottonwood.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Fm: Fillmore	Redosier dogwood	Common chokecherry, American plum.	Eastern redcedar, common hackberry.	Austrian pine, green ash, honeylocust, silver maple, northern red oak, golden willow.	Eastern cottonwood.
Fp. Fillmore					
Gc: Gayville Variant	Siberian peashrub, silver buffaloberry, lilac, Tatarian honeysuckle.	Eastern redcedar, Siberian elm, Rocky Mountain juniper, Russian-olive, ponderosa pine, green ash.	---	---	---
GvD2, GvF2: Geary Variant	Peking cotoneaster	Lilac, Amur honeysuckle, fragrant sumac.	Eastern redcedar, green ash, bur oak, Russian-olive, common hackberry.	Austrian pine, honeylocust, Scotch pine.	---
Ha: Hall	Peking cotoneaster	American plum, lilac, Siberian peashrub.	Eastern redcedar, ponderosa pine.	Honeylocust, green ash, common hackberry, golden willow.	Eastern cottonwood.
Hb: Hobbs	---	American plum, Peking cotoneaster, lilac, Amur honeysuckle.	Eastern redcedar	Green ash, common hackberry, Austrian pine, honeylocust, eastern white pine, bur oak.	Eastern cottonwood.
Hf. Hobbs					
InB: Inavale	American plum	Amur honeysuckle, lilac, fragrant sumac.	Eastern redcedar, Russian mulberry, Russian-olive.	Honeylocust, Austrian pine, common hackberry, Scotch pine, green ash.	---
InD: Inavale	---	---	Eastern redcedar, Austrian pine.	---	---
Kz: Kezan	Redosier dogwood	---	---	Golden willow	Eastern cottonwood.
Lc, Ld: Lawet	---	Lilac, Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, common hackberry, ponderosa pine, blue spruce, midwest Manchurian crabapple.	Golden willow, honeylocust, green ash.	Eastern cottonwood.
Lu: Luton	Redosier dogwood, lilac.	American plum, common chokecherry.	Eastern redcedar, common hackberry, midwest Manchurian crabapple.	Golden willow, green ash, honeylocust, Austrian pine.	Eastern cottonwood.

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Mo, MoC, MoC2, MoD, MoD2: Moody	Lilac	Siberian peashrub, American plum, Tatarian honeysuckle, blue spruce.	Common hackberry, Russian-olive, bur oak, eastern redcedar.	Ponderosa pine, green ash, honeylocust.	---
Na*: Napa	---	---	---	---	---
Luton	Redosier dogwood, lilac.	Common chokecherry, American plum.	Common hackberry, eastern redcedar, midwest Manchurian crabapple.	Golden willow, green ash, Austrian pine, honeylocust.	Eastern cottonwood.
NoC, NoC2, NoD, NoE: Nora	---	Tatarian honeysuckle, Siberian peashrub, American plum, lilac.	Bur oak, common hackberry, blue spruce, Russian-olive, eastern redcedar.	Honeylocust, green ash, ponderosa pine.	---
NpD2*, NpE2*: Nora	---	Tatarian honeysuckle, Siberian peashrub, American plum, lilac.	Bur oak, common hackberry, blue spruce, Russian-olive, eastern redcedar.	Honeylocust, green ash, ponderosa pine.	---
Crofton	Silver buffaloberry, American plum.	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, Russian-olive, common hackberry, Tatarian honeysuckle.	Ponderosa pine, honeylocust, Siberian elm, green ash.	---	---
Of: Ord	Lilac	American plum, common chokecherry.	Eastern redcedar, common hackberry, midwest Manchurian crabapple.	Austrian pine, green ash, golden willow, honeylocust.	Eastern cottonwood.
Pb*. Pits and dumps					
Pc: Platte	Redosier dogwood	American plum, common chokecherry.	Eastern redcedar, common hackberry.	Austrian pine, green ash, honeylocust, golden willow, silver maple, northern red oak.	Eastern cottonwood.
Px*: Platte.					
Inavale	---	Eastern redcedar, Rocky Mountain juniper.	Austrian pine, ponderosa pine, jack pine.	---	---

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
So: Shell	---	Autumn-olive, Amur honeysuckle, Peking cotoneaster, American plum, lilac.	Eastern redcedar, bur oak.	Green ash, Austrian pine, common hackberry, honeylocust.	Eastern cottonwood.
Sp: Shell	---	Autumn-olive, lilac, Peking cotoneaster, Amur honeysuckle, American plum.	Eastern redcedar, bur oak.	Green ash, common hackberry, Austrian pine, honeylocust.	Eastern cottonwood.
StD2: Steinauer	American plum, silver buffaloberry.	Eastern redcedar, Siberian peashrub, Russian-olive, Rocky Mountain juniper, Tatarian honeysuckle, common hackberry.	Ponderosa pine, Siberian elm, honeylocust, green ash.	---	---
StF2. Steinauer					
TmC2*:					
Thurman	Amur honeysuckle, skunkbush sumac, lilac.	Eastern redcedar, Manchurian crabapple, Russian-olive, Siberian peashrub.	Ponderosa pine, green ash, honeylocust, common hackberry.	Siberian elm	---
Moody	---	American plum, lilac, Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, bur oak, Russian-olive, common hackberry, blue spruce.	Green ash, ponderosa pine, honeylocust.	---
TmD2*:					
Thurman	---	Eastern redcedar, Rocky Mountain juniper.	Austrian pine, ponderosa pine, jack pine.	---	---
Moody	---	American plum, lilac, Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, bur oak, Russian-olive, common hackberry, blue spruce.	Green ash, ponderosa pine, honeylocust.	---
Zo: Zook	Redosier dogwood, lilac.	American plum, common chokecherry.	Eastern redcedar, common hackberry, midwest Manchurian crabapple.	Honeylocust, golden willow, green ash, Austrian pine.	Eastern cottonwood.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AcC Alcester	Slight	Slight	Moderate: slope.	Slight	Slight.
Af, Ag Alda	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight	Moderate: flooding.
Be, Bf Belfore	Slight	Slight	Slight	Slight	Slight.
Bh Blendon	Slight	Slight	Slight	Slight	Slight.
BnC Blendon	Slight	Slight	Moderate: slope.	Slight	Slight.
Bo Boel	Severe: flooding.	Moderate: flooding, wetness.	Slight	Moderate: wetness, flooding.	Moderate: wetness, droughty, flooding.
Cg Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
CrC2 Crofton	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
CrD2, CrE2 Crofton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
CrF2 Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Ed Eudora	Severe: flooding.	Slight	Slight	Slight	Slight.
Fm Fillmore	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
Fp Fillmore	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, erodes easily.	Severe: ponding.
Gc Gayville Variant	Severe: flooding, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
GvD2 Geary Variant	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
GvF2 Geary Variant	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ha Hall	Slight	Slight	Slight	Slight	Slight.
Hb Hobbs	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Hf: Hobbs	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
InB: Inavale	Severe: flooding.	Slight	Slight	Slight	Moderate: droughty, flooding.
InD: Inavale	Severe: flooding.	Slight	Severe: slope.	Slight	Moderate: droughty.
Kz: Kezan	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
Lc, Ld: Lawet	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Lu: Luton	Severe: flooding, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, flooding.
Mo: Moody	Slight	Slight	Slight	Slight	Slight.
MoC, MoC2: Moody	Slight	Slight	Moderate: slope.	Slight	Slight.
MoD, MoD2: Moody	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Na*:					
Napa	Severe: flooding, wetness, percs slowly.	Severe: wetness, excess sodium, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: excess sodium, wetness.
Luton	Severe: flooding, wetness, percs slowly.	Severe: too clayey, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey.
NoC, NoC2: Nora	Slight	Slight	Moderate: slope.	Slight	Slight.
NoD, NoE: Nora	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
NpD2*, NpE2*:					
Nora	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Crofton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Of: Ord	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, droughty, flooding.
Pb*. Pits and dumps					

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Pc------------------- Platte	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty, flooding.
Px*:					
Platte---------------	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
Inavale--------------	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding, droughty.
So, Sp---------------- Shell	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
StD2------------------ Steinauer	Moderate: percs slowly, slope.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
StF2------------------ Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
TmC2*:					
Thurman--------------	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.
Moody----------------	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
TmD2*:					
Thurman--------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: droughty, slope.
Moody----------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
Zo-------------------- Zook	Severe: wetness, flooding.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
AcC------------------ Alcester	Good	Good	Good	Good	Good	Good	Good	Very poor.	Good	Good	Very poor.	Good.
Af, Ag-------------- Alda	Fair	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair	Good.
Be, Bf-------------- Belfore	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Bh, BnC------------ Blendon	Fair	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Bo------------------ Boel	Fair	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Poor	Fair.
Cg------------------ Colo	Good	Fair	Good	Fair	Poor	Fair	Good	Good	Fair	Fair	Good	Fair.
CrC2, CrD2, CrE2--- Crofton	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
CrF2--------------- Crofton	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Ed------------------ Eudora	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Good	Good.
Fm------------------ Fillmore	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Good	Fair.
Fp------------------ Fillmore	Poor	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Very poor.	Good	Poor.
Gc------------------ Gayville Variant	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor.
GvD2--------------- Geary Variant	Fair	Good	Fair	Good	Good	Good	Poor	Very poor.	Fair	Poor	Very poor.	Good.
GvF2--------------- Geary Variant	Poor	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Very poor.	Very poor.	Good.
Ha------------------ Hall	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Hb------------------ Hobbs	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Hf------------------ Hobbs	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
InB----------------- Inavale	Fair	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
InD----------------- Inavale	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Kz------------------ Kezan	Poor	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	Fair.
Lc, Ld-------------- Lawet	Poor	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	Poor.
Lu------------------ Luton	Fair	Fair	Fair	Poor	Poor	Fair	Good	Good	Fair	Poor	Good	Fair.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Mo, MoC, MoC2------ Moody	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
MoD, MoD2---------- Moody	Fair	Good	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Na*:												
Napa--------------	Very poor.	Very poor.	Fair	Poor	Good	Good	Poor	Poor	Very Poor.	Good	Poor	Fair.
Luton-------------	Fair	Fair	Fair	Poor	Good	Good	Good	Good	Fair	Poor	Good	Fair.
NoC--------------- Nora	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
NoC2-------------- Nora	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
NoD--------------- Nora	Poor	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
NoE--------------- Nora	Poor	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
NpD2*:												
Nora--------------	Poor	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Crofton-----------	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
NpE2*:												
Nora--------------	Poor	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Crofton-----------	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Of---------------- Ord	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Pb*. Pits and dumps												
Pc---------------- Platte	Fair	Good	Fair	Poor	Fair	Good	Fair	Good	Fair	Poor	Good	Fair.
Px*:												
Platte------------	Very poor.	Very poor.	Poor	Fair	Fair	Fair	Fair	Good	Very poor.	Poor	Fair	Poor.
Inavale-----------	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
So---------------- Shell	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Fair	Very poor.	Good.
Sp---------------- Shell	Good	Good	Good	Good	Fair	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
StD2-------------- Steinauer	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
StF2---------------- Steinauer	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
TmC2*:												
Thurman-----------	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Moody-------------	Fair	Good	Good	Good	Good	Good	Poor	Very poor.	Fair	Poor	Very poor.	Good.
TmD2*:												
Thurman-----------	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Moody-------------	Fair	Good	Good	Good	Good	Good	Poor	Very poor.	Fair	Poor	Very poor.	Good.
Zo----------------- Zook	Good	Fair	Good	Fair	Poor	Good	Good	Good	Fair	Fair	Good	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AcC: Alcester	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Af, Ag: Alda	Severe: wetness, cutbanks cave.	Severe: flooding.	Severe: wetness, flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
Be: Belfore	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Bf: Belfore	Slight	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Bh: Blendon	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
BnC: Blendon	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Bo: Boel	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, droughty, flooding.
Cg: Colo	Severe: wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, low strength, frost action.	Moderate: wetness, floods.
CrC2: Crofton	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
CrD2, CrE2: Crofton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
CrF2: Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Ed: Eudora	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: frost action.	Slight.
Fm: Fillmore	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, low strength, frost action.	Severe: ponding.
Fp: Fillmore	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
Gc: Gayville Variant	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess sodium.
GvD2: Geary Variant	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
GvF2: Geary Variant	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ha---------------- Hall	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Hb---------------- Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
Hf---------------- Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
InB--------------- Inavale	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
InD--------------- Inavale	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
Kz---------------- Kezan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Severe: flooding.
Lc, Ld------------ Lawet	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: frost action.	Moderate: wetness.
Lu---------------- Luton	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Moderate: wetness, flooding.
Mo---------------- Moody	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
MoC, MoC2--------- Moody	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
MoD, MoD2--------- Moody	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Na*:						
Napa-------------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: excess sodium, wetness.
Luton------------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Severe: too clayey.
NoC, NoC2--------- Nora	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
NoD, NoE---------- Nora	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
NpD2*, NpE2*:						
Nora-------------	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
Crofton----------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Of: Ord	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: wetness, droughty, flooding.
Pb*. Pits and dumps						
Pc: Platte	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, droughty, flooding.
Px*: Platte	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
Inavale	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, droughty.
So: Shell	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
Sp: Shell	Moderate: too clayey, wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
StD2: Steinauer	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
StF2: Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
TmC2*: Thurman	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Moody	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
TmD2*: Thurman	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Moody	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Zo: Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, low strength, frost action.	Moderate: wetness, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AcC: Alcester	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Af, Ag: Alda	Severe: flooding, wetness, poor filter.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness, seepage.	Poor: too sandy, seepage.
Be: Belfore	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Bf: Belfore	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Poor: hard to pack.
Bh, BnC: Blendon	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Bo: Boel	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
Cg: Colo	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Poor: wetness, hard to pack.
CrC2: Crofton	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
CrD2, CrE2: Crofton	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
CrF2: Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ed: Eudora	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Moderate: flooding.	Good.
Fm: Fillmore	Severe: percs slowly, ponding.	Severe: ponding.	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Fp: Fillmore	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Gc: Gayville Variant	Severe: percs slowly.	Severe: flooding.	Moderate: flooding, too clayey.	Moderate: flooding.	Poor: hard to pack.
GvD2: Geary Variant	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: hard to pack.
GvF2: Geary Variant	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ha------------------ Hall	Moderate: percs slowly, poor filter.	Severe: seepage.	Severe: seepage.	Slight-----------	Fair: too clayey, thin layer.
Hb, Hf-------------- Hobbs	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
InB----------------- Inavale	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
InD----------------- Inavale	Severe: poor filter.	Severe: seepage, flooding.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Kz------------------ Kezan	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Lc, Ld-------------- Lawet	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Lu------------------ Luton	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: wetness, flooding.	Poor: wetness, too clayey, hard to pack.
Mo------------------ Moody	Moderate: percs slowly.	Slight-----------	Slight-----------	Slight-----------	Good.
MoC, MoC2----------- Moody	Moderate: percs slowly.	Moderate: slope.	Slight-----------	Slight-----------	Good.
MoD, MoD2----------- Moody	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Na*:					
Napa----------------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Luton---------------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: wetness, flooding.	Poor: wetness, too clayey, hard to pack.
NoC, NoC2----------- Nora	Moderate: percs slowly.	Moderate: slope, seepage.	Slight-----------	Slight-----------	Good.
NoD, NoE------------ Nora	Moderate: slope, percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
NpD2*, NpE2*:					
Nora----------------	Moderate: slope, percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Crofton-------------	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Of------------------ Ord	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
Pb*. Pits and dumps					
Pc------------------ Platte	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Px*:					
Platte-------------	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Inavale------------	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: seepage, too sandy, flooding.	Severe: seepage, flooding.	Poor: too sandy, seepage.
So------------------ Shell	Severe: flooding.	Severe: flooding, seepage.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Sp------------------ Shell	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Fair: wetness, thin layer.
StD2---------------- Steinauer	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
StF2---------------- Steinauer	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
TmC2*:					
Thurman------------	Severe: poor filter.	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
Moody--------------	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
TmD2*:					
Thurman------------	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
Moody--------------	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope, thin layer.
Zo------------------ Zook	Severe: percs slowly, wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, too clayey, flooding.	Severe: wetness, flooding.	Poor: too clayey, wetness, hard to pack.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AcC: Alcester	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Af, Ag: Alda	Fair: wetness.	Probable	Probable	Poor: area reclaim.
Be: Belfore	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Bf: Belfore	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Bh, BnC: Blendon	Good	Probable	Improbable: too sandy.	Fair: thin layer.
Bo: Boel	Fair: wetness.	Probable	Improbable: too sandy.	Good.
Cg: Colo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CrC2: Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CrD2, CrE2: Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
CrF2: Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ed: Eudora	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Fm: Fillmore	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.
Fp: Fillmore	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Gc: Gayville Variant	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, excess sodium.
GvD2: Geary Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
GvF2: Geary Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ha: Hall	Good	Probable	Improbable: too sandy.	Good.
Hb, Hf: Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
InB, InD: Inavale	Good	Probable	Improbable: too sandy.	Fair: too sandy.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Kz: Kezan	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Lc, Ld: Lawet	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Lu: Luton	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Mo, MoC, MoC2: Moody	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
MoD, MoD2: Moody	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Na*:				
Napa	Poor: low strength, wetness, shrink-swell.	Improable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.
Luton	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
NoC, NoC2: Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
NoD, NoE: Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
NpD2*, NpE2*:				
Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Of: Ord	Fair: wetness.	Probable	Improbable: too sandy.	Fair: thin layer.
Pb*. Pits and dumps				
Pc: Platte	Fair: wetness.	Probable	Probable	Poor: area reclaim, small stones.
Px*:				
Platte	Fair: wetness.	Probable	Probable	Poor: small stones.
Inavale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
So, Sp: Shell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
StD2: Steinauer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
StF2: Steinauer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
TmC2*:				
Thurman	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
Moody	Good	Probable	Improbable: too sandy.	Fair: too clayey.
TmD2*:				
Thurman	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
Moody	Good	Probable	Improbable: too sandy.	Fair: too clayey, slope.
Zo: Zook	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
AcC: Alcester	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Af: Alda	Severe: seepage.	Severe: seepage, piping.	Flooding, frost action, cutbanks cave.	Wetness, soil blowing, flooding.	Wetness, too sandy, soil blowing.	Favorable.
Ag: Alda	Severe: seepage.	Severe: seepage, piping.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Favorable.
Be, Bf: Belfore	Slight	Moderate: hard to pack.	Deep to water	Favorable	Favorable	Favorable.
Bh: Blendon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing	Too sandy, soil blowing.	Favorable.
BnC: Blendon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope	Too sandy	Favorable.
Bo: Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Droughty, rooting depth.
Cg: Colo	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Flooding, wetness.	Wetness	Wetness.
CrC2: Crofton	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
CrD2, CrE2, CrF2: Crofton	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Ed: Eudora	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Fm: Fillmore	Moderate: seepage.	Severe: hard to pack, ponding.	Percs slowly, frost action, ponding.	Percs slowly, ponding, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Fp: Fillmore	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Gc: Gayville Variant	Slight	Moderate: piping, hard to pack.	Deep to water	Percs slowly, excess salt.	Favorable	Percs slowly, excess sodium.
GvD2, GvF2: Geary Variant	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope	Slope	Slope.
Ha: Hall	Moderate: seepage.	Severe: thin layer.	Deep to water	Favorable	Favorable	Favorable.
Hb, Hf: Hobbs	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
InB, InD: Inavale	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Kz------ Kezan	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness------	Wetness.
Lc, Ld------ Lawet	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness------	Wetness------	Wetness.
Lu------ Luton	Slight------	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, percs slowly, flooding.	Not needed-----	Not needed.
Mo------ Moody	Moderate: seepage.	Moderate: thin layer, piping, hard to pack.	Deep to water	Favorable------	Erodes easily	Erodes easily.
MoC, MoC2------ Moody	Moderate: seepage, slope.	Moderate: thin layer, piping, hard to pack.	Deep to water	Slope------	Erodes easily	Erodes easily.
MoD, MoD2------ Moody	Severe: slope.	Moderate: thin layer, piping, hard to pack.	Deep to water	Slope------	Slope, erodes easily.	Slope, erodes easily.
Na*:						
Napa------	Slight------	Severe: hard to pack, wetness, excess sodium.	Percs slowly, flooding, excess salt.	Wetness, percs slowly, flooding.	Wetness, percs slowly.	Wetness, excess sodium, percs slowly.
Luton------	Slight------	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Not needed-----	Not needed.
NoC, NoC2------ Nora	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope------	Erodes easily	Erodes easily.
NoD, NoE------ Nora	Severe: slope.	Severe: piping.	Deep to water	Slope------	Slope, erodes easily.	Slope, erodes easily.
NpD2*, NpE2*:						
Nora------	Severe: slope.	Severe: piping.	Deep to water	Slope------	Slope, erodes easily.	Slope, erodes easily.
Crofton------	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Of------ Ord	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Droughty.
Pb*. Pits and dumps						
Pc------ Platte	Severe: seepage.	Severe: seepage, wetness, piping.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Px*:						
Platte------	Severe: seepage.	Severe: seepage, wetness.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Px*:						
Inavale	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
So: Shell	Moderate: seepage.	Moderate: piping.	Deep to water	Flooding	Favorable	Favorable.
Sp: Shell	Moderate: seepage.	Moderate: piping, wetness.	Flooding	Wetness, percs slowly, flooding.	Wetness	Favorable.
StD2, StF2: Steinauer	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
TmC2*:						
Thurman	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Moody	Severe: seepage.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
TmD2*:						
Thurman	Severe: slope, seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Droughty, slope.
Moody	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Zo: Zook	Slight	Severe: hard to pack, wetness.	Flooding, percs slowly, frost action.	Wetness, percs slowly.	Not needed	Not needed.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AcC--------------- Alcester	0-24	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	6-20
	24-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
Af--------------- Alda	0-10	Fine sandy loam	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<20	NP-5
	10-20	Fine sandy loam, sandy loam, very fine sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<20	NP-5
	20-60	Coarse sand, gravelly sand.	SP, SM, SP-SM	A-1, A-3, A-2	0	70-100	65-95	30-95	2-15	<20	NP
Ag--------------- Alda	0-10	Loam-------------	ML, CL-ML, CL	A-4	0	95-100	95-100	85-100	50-75	20-35	3-10
	10-24	Fine sandy loam, sandy loam, very fine sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<20	NP-5
	24-60	Coarse sand, gravelly sand.	SP, SM, SP-SM	A-1, A-3, A-2	0	70-100	65-95	30-95	2-15	<20	NP
Be--------------- Belfore	0-16	Silty clay loam	CL, CH	A-6, A-7	0	100	100	100	95-100	35-55	15-30
	16-36	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	100	95-100	45-60	20-30
	36-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	100	95-100	35-55	15-30
Bf--------------- Belfore	0-14	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-55	15-26
	14-32	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	20-30
	32-60	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-55	15-26
Bh--------------- Blendon	0-8	Fine sandy loam	SM	A-4	0	100	90-100	60-100	35-50	20-30	NP-5
	8-34	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	85-100	60-100	35-60	20-33	NP-10
	34-60	Fine sandy loam, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-4	0	85-100	65-100	50-100	10-45	<30	NP-5
BnC-------------- Blendon	0-15	Loam-------------	CL, CL-ML	A-4, A-6	0	100	90-100	85-100	60-75	25-40	4-15
	15-25	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	85-100	60-100	35-60	20-33	NP-10
	25-60	Fine sandy loam, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-4	0	85-100	65-100	50-100	10-45	<30	NP-5
Bo--------------- Boel	0-10	Loam-------------	ML	A-4	0	100	100	85-95	70-95	24-35	2-10
	10-60	Fine sand, loamy fine sand, coarse sand.	SP, SM	A-2, A-3	0	100	95-100	85-95	0-25	---	NP
Cg--------------- Colo	0-24	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
	24-37	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	37-60	Silty clay loam, clay loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
CrC2, CrD2, CrE2, CrF2------------ Crofton	0-5	Silt loam--------	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-50	10-25
	5-60	Silt loam--------	CL	A-6, A-7	0	100	95-100	95-100	95-100	32-50	10-25
Ed--------------- Eudora	0-16	Loam-------------	ML, CL-ML	A-4	0	100	100	95-100	90-100	20-35	2-10
	16-53	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	95-100	90-100	<25	NP-7
	53-60	Loamy fine sand	SM	A-2, A-4	0	100	100	65-90	25-50	---	NP

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
Fm---------------- Fillmore	0-19	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	95-100	20-40	2-20
	19-32	Silty clay, clay	CH, CL	A-7	0	100	100	100	95-100	40-75	20-45
	32-45	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-60	20-40
	45-60	Silt loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	100	95-100	25-75	10-45
Fp---------------- Fillmore	0-18	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	95-100	20-35	2-12
	18-60	Silty clay-------	CH	A-7	0	100	100	100	95-100	50-75	30-45
Gc---------------- Gayville Variant	0-8	Silty clay loam	CH, CL	A-7, A-6	0	100	100	100	95-100	30-55	12-30
	8-30	Silty clay, silty clay loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	35-60	15-35
	30-60	Silty clay loam	CH, CL	A-7, A-6	0	100	100	100	95-100	30-55	12-30
GvD2-------------- Geary Variant	0-6	Silty clay loam	CH, CL	A-7, A-6	0	100	100	100	95-100	30-55	12-30
	6-39	Silty clay loam	CH, CL	A-7, A-6	0	100	100	100	95-100	35-60	15-35
	39-60	Silty clay loam	CH, CL	A-7, A-6	0	100	100	100	95-100	30-55	12-30
GvF2-------------- Geary Variant	0-6	Silty clay loam	CH, CL	A-7, A-6	0	100	100	100	95-100	30-55	12-30
	6-32	Silty clay loam	CH, CL	A-7, A-6	0	100	100	100	95-100	35-60	15-35
	32-60	Silty clay loam	CH, CL	A-7, A-6	0	100	100	100	95-100	30-55	12-30
Ha---------------- Hall	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	98-100	95-100	35-50	15-30
	7-38	Silty clay loam	CL	A-7, A-6	0	100	100	98-100	95-100	35-50	15-30
	38-60	Fine sand, gravelly sand.	SP, SP-SM	A-2, A-3	0	100	95-100	65-85	2-12	<20	NP
Hb---------------- Hobbs	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-20
Hf---------------- Hobbs	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	8-60	Silt loam, silty clay loam.	CL, CL-ML, MH	A-4, A-6, A-7	0	100	100	95-100	80-100	25-50	5-24
InB, InD--------- Inavale	0-7	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	7-15	Fine sand, loamy sand, loamy fine sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
	15-60	Fine sand, loamy sand, loamy fine sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-5
Kz---------------- Kezan	0-10	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	70-90	20-35	2-12
	10-60	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	100	100	95-100	80-95	20-35	2-12
Lc---------------- Lawet	0-24	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	85-100	50-95	20-40	5-15
	24-38	Sandy clay loam, clay loam, silty clay loam.	CL, SC	A-6, A-4	0	100	100	70-100	35-75	20-35	8-20
	38-60	Stratified fine sandy loam to fine sand.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	100	100	60-100	20-60	<20	NP-5
Ld---------------- Lawet	0-24	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	20-50	10-25
	24-55	Sandy clay loam, clay loam, silty clay loam.	CL, SC	A-6, A-4	0	100	100	70-100	35-75	20-35	8-20
	55-60	Stratified fine sandy loam to fine sand.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	100	100	60-100	20-60	<20	NP-5
Lu---------------- Luton	0-15	Silty clay loam	CL, CH	A-7	0	100	100	95-100	95-100	40-60	15-30
	15-34	Silty clay, clay	CH	A-7	0	100	100	95-100	95-100	60-85	35-60
	34-60	Silty clay-------	CH	A-7	0	100	100	95-100	95-100	60-85	35-60

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Mo, MoC, MoC2, MoD, MoD2------- Moody	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	13-25
	7-36	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-100	32-55	11-33
	36-60	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-45	5-25
Na*: Napa------------	0-1	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	90-100	30-40	5-15
	1-36	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	50-80	20-45
	36-60	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7	0	100	100	95-100	90-100	40-75	15-40
Luton-----------	0-18	Silty clay-------	CH	A-7	0	100	100	95-100	95-100	60-85	35-60
	18-33	Silty clay, clay	CH	A-7	0	100	100	95-100	95-100	60-85	35-60
	33-60	Silty clay-------	CH	A-7	0	100	100	95-100	95-100	60-85	35-60
NoC, NoC2, NoD, NoE------------- Nora	0-9	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	12-25
	9-27	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	95-100	85-100	35-50	11-20
	27-60	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	95-100	95-100	95-100	85-100	27-50	6-20
NpD2*, NpE2*: Nora------------	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	12-25
	6-22	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	95-100	85-100	35-50	11-20
	22-60	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	95-100	95-100	95-100	85-100	27-50	6-20
Crofton---------	0-6	Silt loam--------	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-50	10-25
	6-60	Silt loam--------	CL	A-6	0	100	95-100	95-100	95-100	32-50	10-25
Of--------------- Ord	0-16	Fine sandy loam	ML, SM	A-2, A-4	0	95-100	95-100	70-98	30-90	20-35	NP-10
	16-31	Fine sandy loam, loamy fine sand, sandy loam.	ML, SM	A-2, A-4	0	95-100	95-100	70-100	30-85	20-35	NP-10
	31-60	Stratified sand to fine sandy loam.	SM, SP-SM, SM-SC	A-2, A-3	0	95-100	95-100	50-100	5-30	<20	NP-5
Pb*. Pits and dumps											
Pc--------------- Platte	0-11	Loam-------------	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	60-95	22-35	4-15
	11-60	Gravelly coarse sand, coarse sand.	SP-SM, SM	A-1, A-2, A-3	0	70-95	50-95	25-65	5-15	<20	NP
Px*: Platte----------	0-11	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	4-15
	11-17	Fine sandy loam, sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	90-100	70-90	40-65	<25	NP-10
	17-60	Stratified gravelly sand to sand.	SP, SP-SM	A-1, A-2, A-3	0	70-95	50-90	25-60	2-12	<20	NP
Inavale---------	0-5	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	5-25	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
	25-60	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-5

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
So----------------	0-24	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	6-18
Shell	24-33	Silt loam, silty clay loam, loam.	CL	A-4, A-6	0	100	100	95-100	90-100	25-40	10-25
	33-60	Silt loam, loam, silty clay loam.	CL	A-4, A-6	0	100	100	95-100	90-100	25-40	10-25
Sp----------------	0-17	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	85-100	25-40	8-20
Shell	17-41	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	85-100	25-40	8-20
	41-60	Silty clay-------	CL, CH	A-7	0	100	100	100	95-100	45-60	20-35
StD2, StF2-------	0-4	Clay loam--------	CL	A-6, A-7	0-5	95-100	95-100	85-100	55-90	30-50	15-25
Steinauer	4-14	Clay loam--------	CL, CH	A-6, A-7	0-5	95-100	95-100	90-100	70-90	30-55	12-30
	14-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	95-100	90-100	60-75	20-45	10-26
TmC2*:											
Thurman----------	0-15	Loamy fine sand	SM, SP-SM	A-2, A-3, A-4	0	100	100	90-100	5-40	<20	NP
	15-60	Loamy fine sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
Moody------------	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	13-25
	6-20	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	13-25
	20-47	Silt loam--------	ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	7-20
	47-56	Fine sandy loam	SM	A-2, A-4	0	100	100	75-90	35-50	---	NP
	56-60	Fine sand--------	SP-SM, SM	A-2, A-3	0	100	100	65-80	5-25	---	NP
TmD2*:											
Thurman----------	0-25	Loamy fine sand	SM, SP-SM	A-2, A-3, A-4	0	100	100	90-100	5-40	<20	NP
	25-60	Loamy fine sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
Moody------------	0-5	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	13-25
	5-35	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	13-25
	35-46	Silt loam--------	ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	7-20
	46-60	Fine sand--------	SP-SM, SM	A-2, A-3	0	100	100	65-80	5-25	---	NP
Zo----------------	0-21	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
Zook	21-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodi-bility group	Organic matter
									K	T		
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
AcC---------------	0-24	20-26	1.20-1.30	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.28	5	6	2-4
Alcester	24-60	20-32	1.20-1.35	0.6-2.0	0.19-0.22	6.6-8.4	<2	Moderate	0.28			
Af---------------	0-10	5-12	1.60-1.80	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low--------	0.20	4	3	2-4
Alda	10-20	3-10	1.70-1.90	2.0-6.0	0.15-0.17	7.4-8.4	<2	Low--------	0.20			
	20-60	0-2	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Ag---------------	0-10	12-25	1.40-1.60	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.28	4	6	2-4
Alda	10-24	3-10	1.70-1.90	2.0-6.0	0.15-0.17	7.4-8.4	<2	Low--------	0.20			
	24-60	0-2	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Be---------------	0-16	25-39	1.30-1.50	0.2-0.6	0.21-0.24	5.6-6.5	<2	High-------	0.32	5	7	2-4
Belfore	16-36	38-42	1.20-1.40	0.2-0.6	0.11-0.18	5.6-7.8	<2	High-------	0.32			
	36-60	25-35	1.30-1.50	0.2-0.6	0.18-0.22	6.1-8.4	<2	High-------	0.32			
Bf---------------	0-14	27-37	1.30-1.40	0.2-0.6	0.21-0.23	5.6-6.5	<2	High-------	0.32	5	7	2-3
Belfore	14-32	38-42	1.20-1.30	0.2-0.6	0.18-0.20	5.6-6.5	<2	High-------	0.32			
	32-60	27-37	1.30-1.40	0.2-0.6	0.18-0.20	6.6-7.8	<2	High-------	0.32			
Bh---------------	0-8	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	<2	Low--------	0.20	5	3	2-3
Blendon	8-34	10-20	1.20-1.30	0.6-6.0	0.11-0.18	6.1-7.3	<2	Low--------	0.20			
	34-60	5-18	1.30-1.45	2.0-20	0.08-0.15	6.6-8.4	<2	Low--------	0.20			
BnC--------------	0-15	15-25	1.20-1.30	0.6-2.0	0.18-0.20	5.6-7.3	<2	Low--------	0.20	5	5	2-4
Blendon	15-25	10-20	1.20-1.30	0.6-6.0	0.11-0.18	6.1-7.3	<2	Low--------	0.20			
	25-60	5-18	1.30-1.45	2.0-20	0.08-0.15	6.6-8.4	<2	Low--------	0.20			
Bo---------------	0-10	15-25	1.30-1.40	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	5	6	1-3
Boel	10-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.20			
Cg---------------	0-24	27-32	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	<2	High-------	0.28	5	7	5-7
Colo	24-37	30-35	1.25-1.35	0.2-0.6	0.18-0.20	6.1-7.3	<2	High-------	0.28			
	37-60	30-35	1.35-1.45	0.2-0.6	0.18-0.20	6.1-7.3	<2	High-------	0.28			
CrC2, CrD2, CrE2,												
CrF2-------------	0-5	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-1
Crofton	5-60	15-27	1.15-1.25	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Ed---------------	0-16	10-20	1.40-1.50	0.6-2.0	0.22-0.24	6.1-7.8	<2	Low--------	0.28	5	5	1-3
Eudora	16-53	7-17	1.45-1.55	0.6-2.0	0.17-0.19	6.1-8.4	<2	Low--------	0.43			
	53-60	3-10	1.60-1.80	6.0-20	0.08-0.10	7.4-8.4	<2	Low--------	0.17			
Fm---------------	0-19	18-35	1.30-1.40	0.6-2.0	0.21-0.24	5.6-6.5	<2	Moderate	0.37	4	6	3-4
Fillmore	19-32	40-55	1.30-1.50	<0.06	0.11-0.14	5.6-7.8	<2	High-------	0.37			
	32-45	32-40	1.20-1.40	0.2-0.6	0.18-0.20	6.6-7.8	<2	High-------	0.37			
	45-60	18-45	1.30-1.50	0.06-2.0	0.10-0.22	6.6-8.4	<2	Moderate	0.37			
Fp---------------	0-18	17-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-6.5	<2	Low--------	0.37	4	6	2-3
Fillmore	18-60	40-55	1.10-1.30	<0.6	0.10-0.14	5.6-7.3	<2	High-------	0.37			
Gc---------------	0-8	30-40	1.25-1.35	0.2-0.6	0.21-0.23	6.6-8.4	<2	High-------	0.32	5	7	1-3
Gayville Variant	8-30	35-50	1.30-1.40	<0.06	0.15-0.17	7.4-9.0	2-8	High-------	0.32			
	30-60	30-40	1.30-1.40	0.2-0.6	0.10-0.13	7.9-9.0	<2	High-------	0.32			
GvD2-------------	0-6	30-35	1.20-1.30	0.2-0.6	0.21-0.23	5.6-7.3	<2	Moderate	0.32	5	7	.5-1
Geary Variant	6-39	30-35	1.25-1.35	0.2-0.6	0.18-0.20	6.1-7.8	<2	Moderate	0.32			
	39-60	30-35	1.25-1.40	0.2-0.6	0.18-0.20	6.6-7.8	<2	Moderate	0.32			
GvF2-------------	0-6	30-35	1.20-1.30	0.2-0.6	0.21-0.23	5.6-7.3	<2	Moderate	0.32	5	7	.5-1
Geary Variant	6-32	30-35	1.25-1.35	0.2-0.6	0.18-0.20	6.1-7.8	<2	Moderate	0.32			
	32-60	30-35	1.25-1.40	0.2-0.6	0.18-0.20	6.6-7.8	<2	Moderate	0.32			
Ha---------------	0-7	27-35	1.20-1.35	0.2-0.6	0.21-0.23	6.1-7.3	<2	Moderate	0.32	5	7	2-4
Hall	7-38	25-35	1.40-1.50	0.2-0.6	0.18-0.20	6.1-7.3	<2	Moderate	0.32			
	38-60	0-3	1.70-1.90	6.0-20	0.05-0.07	6.6-7.3	<2	Low--------	0.10			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH	Mmhos/cm					Pct
Hb---------------- Hobbs	0-7	15-30	1.20-1.40	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	7-60	15-30	1.20-1.40	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.32			
Hf---------------- Hobbs	0-8	15-30	1.20-1.40	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	8-60	15-30	1.20-1.40	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.32			
InB, InD--------- Inavale	0-7	2-10	1.50-1.60	6.0-20	0.10-0.12	6.6-7.8	<2	Low--------	0.17	5	2	.5-1
	7-15	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low--------	0.17			
	15-60	3-10	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.17			
Kz---------------- Kezan	0-10	24-27	1.20-1.40	0.6-2.0	0.22-0.24	6.6-7.8	<2	Low--------	0.32	5	6	2-4
	10-60	24-27	1.20-1.40	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.32			
Lc---------------- Lawet	0-24	15-25	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.28	5	4L	3-6
	24-38	22-35	1.30-1.50	0.2-2.0	0.14-0.19	7.4-9.0	<2	Moderate	0.28			
	38-60	0-15	1.50-1.80	2.0-20	0.05-0.13	6.6-8.4	<2	Low--------	0.17			
Ld---------------- Lawet	0-24	27-30	1.20-1.40	0.2-2.0	0.21-0.23	7.4-8.4	<2	Moderate	0.28	5	4L	3-6
	24-55	22-35	1.30-1.50	0.2-2.0	0.14-0.19	7.4-9.0	<2	Moderate	0.28			
	55-60	0-15	1.50-1.80	2.0-20	0.05-0.13	6.6-8.4	<2	Low--------	0.17			
Lu---------------- Luton	0-15	35-40	1.30-1.35	0.6-2.0	0.12-0.14	6.6-7.8	<2	High-------	0.37	5	7	3-5
	15-34	50-65	1.30-1.35	<0.06	0.12-0.14	6.6-7.8	<2	High-------	0.28			
	34-60	40-60	1.35-1.45	<0.06	0.11-0.13	6.6-8.4	<2	High-------	0.28			
Mo, MoC, MoC2, MoD, MoD2-------- Moody	0-7	27-35	1.25-1.30	0.2-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.32	5	7	1-3
	7-36	27-35	1.20-1.30	0.2-0.6	0.18-0.20	6.1-7.8	<2	Moderate	0.43			
	36-60	20-30	1.20-1.30	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
Na*: Napa-------------	0-1	15-25	1.15-1.25	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low--------	0.28	3	6	2-5
	1-36	45-60	1.20-1.30	<0.06	0.13-0.17	7.4-9.0	4-16	High-------	0.28			
	36-60	35-50	1.25-1.25	<0.06	0.11-0.15	7.4-9.0	2-8	High-------	0.28			
Luton------------	0-18	45-60	1.30-1.35	<0.06	0.12-0.14	6.6-7.8	<2	High-------	0.28	5	4	3-5
	18-33	50-65	1.30-1.35	<0.06	0.12-0.14	6.6-7.8	<2	High-------	0.28			
	33-60	40-60	1.35-1.45	<0.06	0.11-0.13	6.6-8.4	<2	High-------	0.28			
NoC, NoC2, NoD, NoE-------------- Nora	0-9	27-35	1.20-1.25	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7	1-4
	9-27	20-35	1.25-1.35	0.6-2.0	0.17-0.20	6.1-7.3	<2	Moderate	0.43			
	27-60	18-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
NpD2*, NpE2*: Nora-------------	0-6	27-35	1.20-1.25	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7	1-2
	6-22	20-35	1.25-1.35	0.6-2.0	0.17-0.20	6.1-7.3	<2	Moderate	0.43			
	22-60	18-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
Crofton----------	0-6	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-2
	6-60	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Of---------------- Ord	0-16	8-15	1.40-1.60	0.6-6.0	0.16-0.24	6.1-9.0	<2	Low--------	0.20	5	3	1-2
	16-31	8-15	1.50-1.70	2.0-6.0	0.15-0.17	6.6-8.4	<2	Low--------	0.20			
	31-60	3-12	1.60-1.80	2.0-20	0.02-0.04	6.6-8.4	<2	Low--------	0.20			
Pb*. Pits and dumps												
Pc---------------- Platte	0-11	10-20	1.50-1.70	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	2	4L	1-2
	11-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Px*: Platte-----------	0-11	8-20	1.50-1.50	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.28	2	5	1-2
	11-17	3-10	1.60-1.80	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low--------	0.20			
	17-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.15			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Px*:												
Inavale---------	0-5	7-18	1.50-1.60	6.0-20	0.10-0.12	6.6-7.8	<2	Low--------	0.17	5	2	.5-1
	5-25	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low--------	0.17			
	25-60	3-10	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.17			
So--------------- Shell	0-24	15-27	1.20-1.30	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low--------	0.32	5	6	2-4
	24-33	20-30	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.3	<2	Low--------	0.32			
	33-60	20-30	1.20-1.30	0.6-2.0	0.20-0.22	6.1-7.8	<2	Low--------	0.32			
Sp--------------- Shell	0-17	17-27	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low--------	0.32	5	6	2-4
	17-41	17-27	1.25-1.40	0.6-2.0	0.20-0.22	6.1-7.8	<2	Low--------	0.32			
	41-60	40-55	1.15-1.30	0.06-0.2	0.10-0.13	6.6-8.4	<2	High-------	0.32			
StD2, StF2------- Steinauer	0-4	27-32	1.30-1.60	0.2-0.6	0.17-0.19	7.4-8.4	<2	Moderate	0.32	5	4L	.5-2
	4-14	27-32	1.30-1.60	0.2-0.6	0.15-0.17	7.9-8.4	<2	Moderate	0.32			
	14-60	16-30	1.30-1.60	0.2-2.0	0.14-0.19	7.9-8.4	<2	Moderate	0.32			
TmC2*:												
Thurman---------	0-15	5-12	1.60-1.80	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2	1-2
	15-60	2-10	1.60-1.80	6.0-20	0.06-0.11	6.1-7.3	<2	Low--------	0.17			
Moody-----------	0-6	27-35	1.20-1.30	0.2-0.6	0.21-0.23	5.6-7.3	<2	Moderate	0.28	5	7	1-2
	6-20	27-35	1.20-1.30	0.2-0.6	0.21-0.23	5.6-7.3	<2	Moderate	0.28			
	20-47	20-27	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.3	<2	Moderate	0.43			
	47-56	5-15	1.45-1.60	2.0-6.0	0.14-0.16	6.6-8.4	<2	Low--------	0.24			
	56-60	3-10	1.60-1.75	6.0-20	0.05-0.07	6.6-8.4	<2	Low--------	0.15			
TmD2*:												
Thurman---------	0-25	5-12	1.60-1.80	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2	1-2
	25-60	2-10	1.60-1.80	6.0-20	0.06-0.11	6.1-7.3	<2	Low--------	0.17			
Moody-----------	0-5	27-35	1.20-1.30	0.2-0.6	0.21-0.23	5.6-7.3	<2	Moderate	0.28	5	7	1-2
	5-35	27-35	1.20-1.30	0.2-0.6	0.21-0.23	5.6-7.3	<2	Moderate	0.28			
	35-46	20-27	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.3	<2	Moderate	0.43			
	46-60	3-10	1.60-1.75	6.0-20	0.05-0.07	6.6-8.4	<2	Low--------	0.15			
Zo--------------- Zook	0-21	32-38	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	<2	High-------	0.28	5	7	5-7
	21-60	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	<2	High-------	0.28			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth*	Kind	Months		Uncoated steel	Concrete
					Ft					
AcC: Alcester	B	None	---	---	>6.0	---	---	High	Moderate	Low.
Af, Ag: Alda	C	Occasional	Brief	Apr-Jul	2.0-4.0	Apparent	Nov-May	High	Moderate	Low.
Be, Bf: Belfore	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Bh, BnC: Blendon	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Bo: Boel	A	Occasional	Brief	Mar-Jun	1.5-3.5	Apparent	Nov-May	Moderate	High	Low.
Cg: Colo	B/D	Occasional	Very brief to long.	Feb-Nov	2.0-3.0	Apparent	Nov-Jul	High	High	Moderate.
CrC2, CrD2, CrE2, CrF2: Crofton	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Ed: Eudora	B	Rare	---	---	>6.0	---	---	High	Low	Low.
Fm: Fillmore	D	None	---	---	+.5-1.0	Perched	Mar-Jul	High	High	Low.
Fp: Fillmore	D	None	---	---	+1-1.0	Perched	Mar-Jul	High	High	Low.
Gc: Gayville Variant	D	Rare	---	---	>6.0	---	---	Moderate	High	Low.
GvD2, GvF2: Geary Variant	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Ha: Hall	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Hb: Hobbs	B	Occasional	Brief	Apr-Sep	>6.0	---	---	Moderate	Low	Low.
Hf: Hobbs	B	Frequent	Brief	Apr-Sep	>6.0	---	---	Moderate	Low	Low.
InB: Inavale	A	Occasional	Very brief	Jan-Jul	>6.0	---	---	Low	Moderate	Low.
InD: Inavale	A	Rare	---	---	>6.0	---	---	Low	Moderate	Low.
Kz: Kezan	B	Frequent	Brief	Mar-Jul	1.0-3.0	Apparent	Nov-Jun	High	High	Low.
Lc, Ld: Lawet	B/D	Rare	---	---	1.0-2.0	Apparent	May-Nov	High	High	Moderate.
Lu: Luton	D	Occasional	Brief	Mar-Jun	1.0-3.0	Apparent	Nov-Jul	Moderate	High	Low.
Mo, MoC, MoC2, MoD, MoD2: Moody	B	None	---	---	>6.0	---	---	High	Moderate	Low.

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth*	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
Na**:										
Napa	D	Occasional	Brief	Apr-Jun	1.0-3.0	Apparent	Nov-Jul	Moderate	High	Moderate.
Luton	D	Occasional	Brief	Mar-Jun	1.0-3.0	Apparent	Nov-Jul	Moderate	High	Low.
NoC, NoC2, NoD, NoE Nora	B	None	---	---	>6.0	---	---	High	Moderate	Low.
NpD2**, NpE2**:										
Nora	B	None	---	---	>6.0	---	---	High	Moderate	Low.
Crofton	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Of Ord	B	Occasional	Brief	Mar-May	1.5-3.5	Apparent	Nov-May	High	High	Low.
Pb**. Pits and dumps										
Pc Platte	B/D	Occasional	Brief	Mar-Oct	1.0-2.0	Apparent	Feb-Jun	Moderate	High	Moderate.
Px**:										
Platte	B/D	Frequent	Brief	Mar-May	1.0-2.0	Apparent	Mar-Apr	Moderate	High	Moderate.
Inavale	A	Occasional	Very brief	Jan-Jul	>6.0	---	---	Low	Moderate	Low.
So Shell	B	Occasional	Brief	Mar-Jun	>6.0	---	---	Moderate	Low	Low.
Sp Shell	B	Occasional	Brief	Mar-Jun	2.5-4.0	Perched	Nov-Jun	Moderate	Low	Low.
StD2, StF2 Steinauer	B	None	---	---	>6.0	---	---	Moderate	High	Low.
TmC2**, TmD2**:										
Thurman	A	None	---	---	>6.0	---	---	Low	Low	Low.
Moody	B	None	---	---	>6.0	---	---	High	Moderate	Low.
Zo Zook	C/D	Occasional	Brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-May	High	High	Moderate.

* A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water is above the surface. The second numeral indicates the depth below the surface.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution									Liquid limit	Plasticity index	Moisture density
			Percentage passing sieve--						Percentage smaller than--					
	AASHTO	Unified	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm			
												Pct		G/cm3
Alcester silt loam[1] (S76NE-037-026)														
Ap--------0 to 7	A-7-6(11)	CL	100	100	100	100	100	99	94	31	24	41	17	2.62
B2-------30 to 36	A-7-6(15)	CL	100	100	100	100	100	99	92	39	30	49	23	2.65
C--------36 to 60	A-7-6(15)	CL	100	100	100	100	100	99	92	32	28	47	24	2.69
Alda loam:[2] (S78NE-037-091)														
Ap--------0 to 11	A-4 (05)	ML	100	100	100	100	96	60	48	10	7	30	6	2.59
AC-------11 to 21	A-4 (02)	SM	100	100	100	100	95	43	25	5	4	--	NP	2.65
C1-------21 to 60	A-3 (03)	SP	100	99	98	93	57	2	1	--	--	--	NP	2.63
Blendon fine sandy loam:[3] (S77NE-037-057)														
Ap--------0 to 8	A-4 (01)	SM	100	100	100	100	95	40	--	9	--	18	3	2.60
B2--------8 to 15	A-4 (02)	SM-SC	100	100	100	100	94	38	--	10	--	21	6	2.62
C1-------26 to 49	A-2-4(01)	SM	100	100	100	99	88	14	--	4	--	--	NP	2.63
Crofton silt loam:[4] (S76NE-037-016)														
Ap--------0 to 5	A-7-6(13)	CL	100	100	100	100	99	98	91	36	27	45	21	2.69
AC--------5 to 14	A-7-6(14)	CL	100	100	99	98	98	97	90	33	26	45	22	2.68
C1-------14 to 32	A-7-6(13)	CL	100	100	100	99	99	98	92	34	26	43	21	2.70
Hobbs silt loam:[5] (S76NE-037-019)														
Ap--------0 to 7	A-6 (10)	CL	100	100	100	100	100	99	92	24	19	39	15	2.63
AC-------34 to 48	A-7-6(12)	CL	100	100	100	100	100	99	93	34	27	43	19	2.65
C1-------48 to 60	A-7-6(14)	CL	100	100	100	100	100	99	93	35	31	46	23	2.69
Lawet silt loam:[6] (S77NE-037-050)														
Apca------0 to 7	A-7-5(12)	ML	100	100	100	100	100	88	82	32	24	48	16	2.55
Bca------16 to 20	A-6 (10)	CL	100	100	100	100	99	71	67	37	33	34	16	2.65
C1g------20 to 27	A-4 (05)	CL	100	100	100	100	98	61	55	36	26	23	10	2.66
Moody silty clay loam:[7] (S77NE-037-045)														
Ap--------0 to 7	A-6 (11)	CL	100	100	100	100	100	99	92	40	33	40	17	2.63
B3-------26 to 36	A-7-6(16)	CL-CH	100	100	100	100	100	100	93	41	37	50	26	2.70
C2-------49 to 60	A-7-6(17)	CL-CH	100	100	100	100	100	100	94	40	36	50	27	2.71
Napa silt loam:[8] (S77NE-037-041)														
Ap--------0 to 6	A-6 (11)	CL	100	100	100	100	100	99	93	30	21	40	17	2.62
B2-------15 to 24	A-7-6(32)	CH	100	100	100	100	99	94	93	62	53	83	55	2.69
C1ca-----24 to 42	A-7-6(32)	CH	100	100	100	100	99	91	90	66	60	84	55	2.69

See footnotes at end of table.

TABLE 17.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution: Percentage passing sieve--						Percentage smaller than--			Liquid limit	Plasticity index	Moisture density
	AASHTO	Unified	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm			
												Pct		G/cm3
Ord fine sandy loam:[9] (S78NE-037-092)														
A1--------0 to 8	A-4 (08)	ML	100	100	100	100	99	86	70	14	10	34	9	2.60
AC-------19 to 28	A-4 (08)	ML	100	100	100	100	100	85	68	8	7	25	NP	2.62
C1-------28 to 46	A-2-4(00)	SM	100	100	100	99	93	16	6	1	1	--	NP	2.65
Zook silty clay loam:[10] (S77NE-037-046)														
Ap--------0 to 5	A-7-6(13)	CL	100	100	100	100	100	99	96	43	35	44	21	2.61
B22------16 to 24	A-7-6(24)	CH	100	100	100	100	100	98	96	56	50	64	37	2.68
C1-------30 to 48	A-7-6(18)	CH	100	100	100	100	100	99	94	44	40	51	29	2.67

[1]Alcester silt loam:
1,050 feet E. and 750 feet S. of NW. corner, sec. 6, T. 20 N., R. 3 E.
[2]Alda loam:
1,350 feet W. and 1,000 feet N. of SE. corner, sec. 13, T. 17 N., R. 3 E.
[3]Blendon fine sandy loam:
2,700 feet S. and 2,500 feet E. of NW. corner, sec. 11, T. 17 N., R. 2 E.
[4]Crofton silt loam:
1,320 feet W. and 525 feet N. of SE. corner, sec. 5, T. 20 N., R. 4 E.
[5]Hobbs silt loam:
800 feet W. and 50 feet S. of NE. corner, sec. 3, T. 20 N., R. 4 E.
[6]Lawet silt loam:
2,700 feet N. and 300 feet E. of SW. corner, sec. 9, T. 17 N., R. 3 E.
[7]Moody silty clay loam:
1,800 feet E. and 800 feet S. of NW. corner, sec. 12, T. 18 N., R. 4 E.
[8]Napa silt loam:
1,320 feet N. and 400 feet E. of SW. corner, sec. 36, T. 18 N., R. 4 E.
[9]Ord fine sandy loam:
1,100 feet N. and 2,500 feet W. of SE. corner, sec. 35, T. 17 N., R. 2 E.
[10]Zook silty clay loam:
100 feet W. and 100 feet S. of NE. corner, sec. 16, T. 18 N., R. 4 E.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Alcester	Fine-silty, mixed, mesic Cumulic Haplustolls
Alda	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
Belfore	Fine, montmorillonitic, mesic Udic Haplustolls
Blendon	Coarse-loamy, mixed, mesic Pachic Haplustolls
Boel	Sandy, mixed, mesic Fluvaquentic Haplustolls
Colo	Fine-silty, mixed, mesic Cumulic Haplaquolls
Crofton	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Eudora	Coarse-silty, mixed, mesic Fluventic Hapludolls
Fillmore	Fine, montmorillonitic, mesic Typic Argialbolls
Gayville Variant	Fine, montmorillonitic, mesic Typic Natrustolls
Geary Variant	Fine-silty, mixed, mesic Udic Ustochrepts
Hall	Fine-silty, mixed, mesic Pachic Argiustolls
Hobbs	Fine-silty, mixed, nonacid, mesic Mollic Ustifluvents
Inavale	Sandy, mixed, mesic Typic Ustifluvents
Kezan	Fine-silty, mixed, nonacid, mesic Mollic Fluvaquents
Lawet	Fine-loamy, mesic Typic Calciaquolls
Luton*	Fine, montmorillonitic, mesic Vertic Haplaquolls
Moody	Fine-silty, mixed, mesic Udic Haplustolls
Napa	Fine, montmorillonitic, mesic Typic Natraquolls
Nora	Fine-silty, mixed, mesic Udic Haplustolls
Ord	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
Platte*	Sandy, mixed, mesic Mollic Fluvaquents
Shell	Fine-silty, mixed, mesic Cumulic Haplustolls
Steinauer	Fine-loamy, mixed (calcareous), mesic Typic Udorthents
Thurman*	Sandy, mixed, mesic Udorthentic Haplustolls
Zook	Fine, montmorillonitic, mesic Cumulic Haplaquolls

*The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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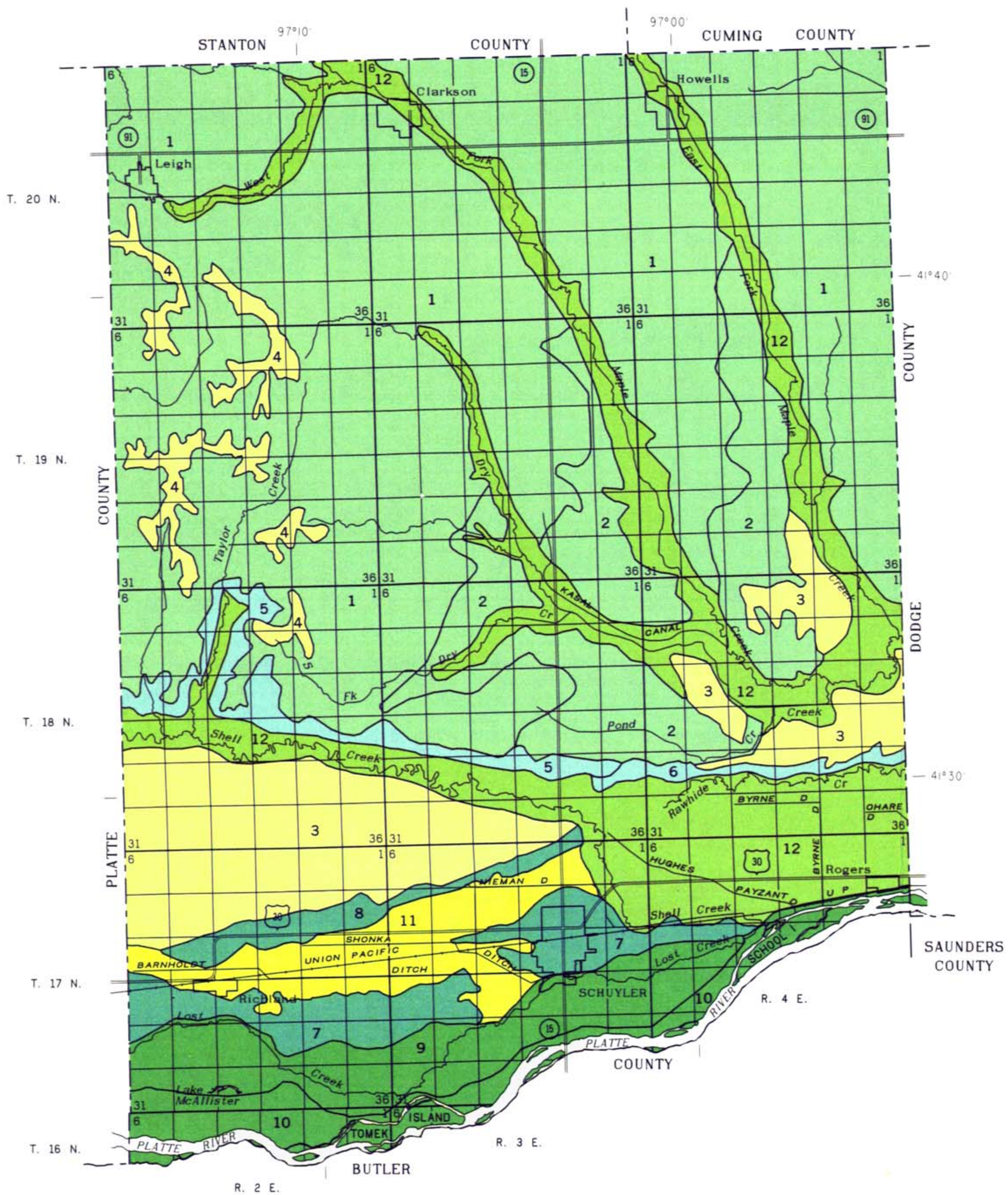


U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UNIVERSITY OF NEBRASKA CONSERVATION AND SURVEY DIVISION

GENERAL SOIL MAP

COLFAX COUNTY, NEBRASKA

Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

SOIL LEGEND*

SILTY SOILS ON UPLANDS AND FOOT SLOPES

1 Nora-Crofton-Moody association: Deep, gently sloping to steep, well drained and somewhat excessively drained silty soils that formed in loess; on uplands

2 Moody-Alcester association: Deep, gently sloping and strongly sloping, well drained silty soils that formed in loess and in a mixture of colluvium and alluvium; on uplands and foot slopes

SILTY SOILS ON UPLANDS AND STREAM TERRACES AND IN UPLAND DEPRESSIONS

3 Moody-Fillmore association: Deep, nearly level and gently sloping, well drained and poorly drained silty soils that formed in loess; on uplands and stream terraces and in upland depressions

4 Belfore association: Deep, nearly level, well drained silty soils that formed in loess; on uplands

SILTY, LOAMY, AND SANDY SOILS ON UPLAND SLOPES ADJACENT TO VALLEYS

5 Steinauer-Moody association: Deep, strongly sloping to steep, well drained loamy and silty soils that formed in glacial till and loess; on uplands

6 Moody-Thurman association: Deep, gently sloping to strongly sloping, well drained and somewhat excessively drained silty and sandy soils that formed in loess and eolian sands; on uplands

LOAMY AND SILTY SOILS ON STREAM TERRACES

7 Blendon association: Deep, nearly level, well drained loamy soils that formed in alluvium; on stream terraces

8 Hall association: Deep, nearly level, well drained silty soils that formed in loess, colluvium, and alluvium; on stream terraces

LOAMY AND SANDY SOILS ON BOTTOM LANDS

9 Alda-Ord association: Nearly level, somewhat poorly drained loamy soils that are moderately deep and deep to mixed sand and gravel; formed in alluvium on bottom lands

10 Platte-Inavale association: Nearly level to strongly sloping, somewhat poorly drained and somewhat excessively drained loamy and sandy soils that are shallow and deep to mixed sand and gravel; formed in alluvium on bottom lands

SILTY, HIGHLY CALCAREOUS SOILS ON BOTTOM LANDS

11 Lawet association: Deep, nearly level, poorly drained silty soils that formed in alluvium; on bottom lands

SILTY SOILS ON BOTTOM LANDS

12 Zook-Shell-Hobbs association: Deep, nearly level, poorly drained and well drained silty soils that formed in alluvium; on bottom lands

*Texture terms refer to the surface layer of the major soils.

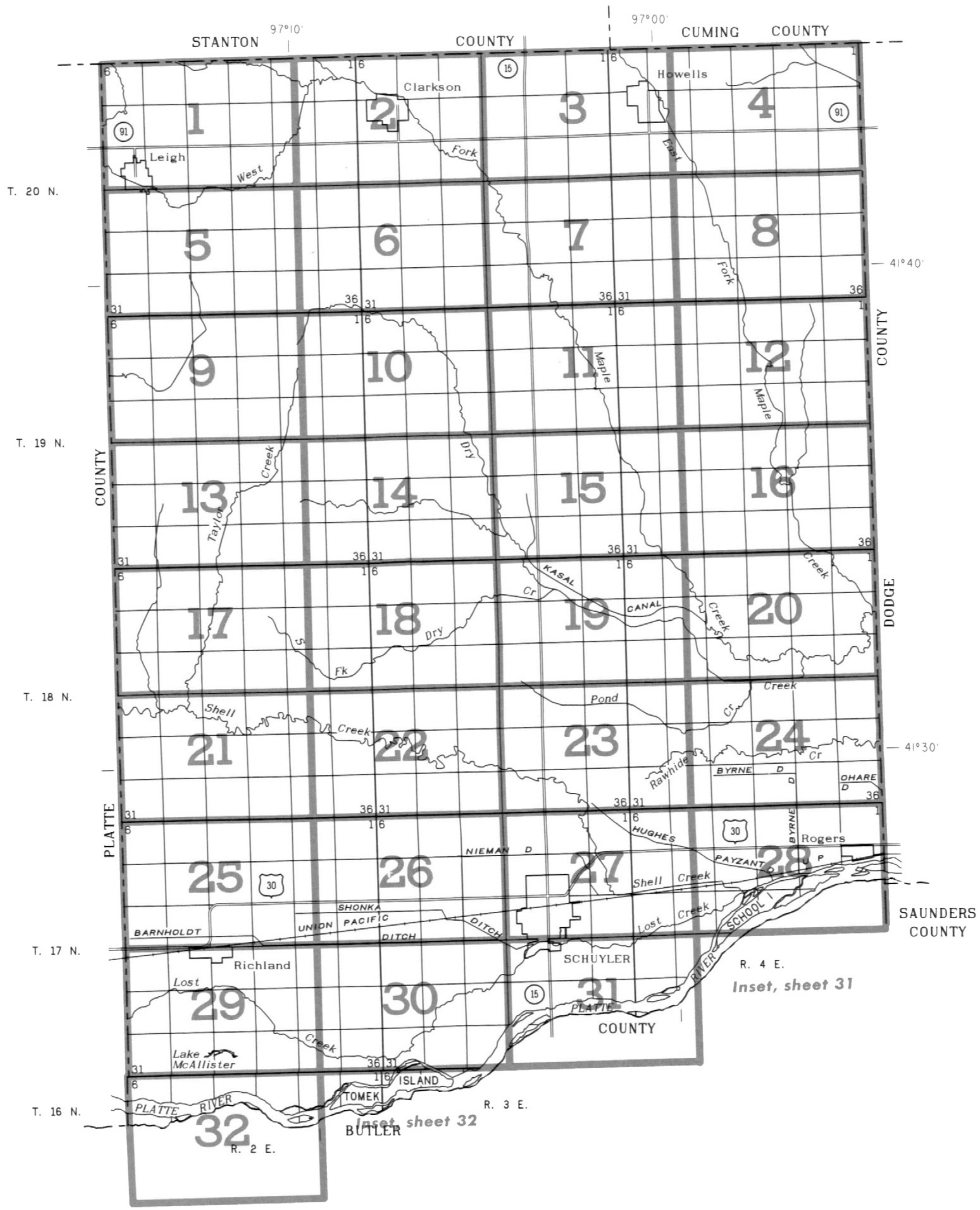
Compiled 1980

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
COLFAX COUNTY, NEBRASKA

Scale 1:190,080



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and a number. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 indicates that the soil is eroded.

SYMBOL	NAME
AcC	Alcester silt loam, 2 to 6 percent slopes
Af	Alda fine sandy loam, 0 to 1 percent slopes
Ag	Alda loam, 0 to 1 percent slopes
Be	Belfore silty clay loam, 0 to 2 percent slopes
Bf	Belfore silty clay loam, terrace, 0 to 2 percent slopes
Bh	Blendon fine sandy loam, 0 to 2 percent slopes
BnC	Blendon loam, 2 to 6 percent slopes
Bo	Boel fine sandy loam, 0 to 2 percent slopes
Cg	Colo silty clay loam, 0 to 2 percent slopes
CrC2	Crofton silt loam, 2 to 6 percent slopes, eroded
CrD2	Crofton silt loam, 6 to 11 percent slopes, eroded
CrE2	Crofton silt loam, 11 to 15 percent slopes, eroded
CrF2	Crofton silt loam, 15 to 30 percent slopes, eroded
Ed	Eudora loam, sandy substratum, 0 to 2 percent slopes
Fm	Fillmore silt loam, 0 to 1 percent slopes
Fp	Fillmore silt loam, ponded, 0 to 1 percent slopes
Gc	Gayville Variant silty clay loam, 0 to 2 percent slopes
GvD2	Geary Variant silty clay loam, 6 to 11 percent slopes, eroded
GvF2	Geary Variant silty clay loam, 11 to 30 percent slopes, eroded
Ha	Hall silty clay loam, sandy substratum, 0 to 1 percent slopes
Hb	Hobbs silt loam, 0 to 2 percent slopes
Hf	Hobbs silt loam, channeled
InB	Inavale loamy fine sand, 0 to 3 percent slopes
InD	Inavale loamy fine sand, 3 to 9 percent slopes
Kz	Kezan silt loam, 0 to 2 percent slopes
Lc	Lawet silt loam, 0 to 1 percent slopes
Ld	Lawet silty clay loam, 0 to 1 percent slopes
Lu	Luton silty clay, 0 to 1 percent slopes
Mo	Moody silty clay loam, 0 to 2 percent slopes
MoC	Moody silty clay loam, 2 to 6 percent slopes
MoC2	Moody silty clay loam, 2 to 6 percent slopes, eroded
MoD	Moody silty clay loam, 6 to 11 percent slopes
MoD2	Moody silty clay loam, 6 to 11 percent slopes, eroded
Na	Napa-Luton complex, 0 to 1 percent slopes
NoC	Nora silty clay loam, 2 to 6 percent slopes
NoC2	Nora silty clay loam, 2 to 6 percent slopes, eroded
NoD	Nora silty clay loam, 6 to 11 percent slopes
NoE	Nora silty clay loam, 11 to 15 percent slopes
NpD2	Nora-Crofton complex, 6 to 11 percent slopes, eroded
NpE2	Nora-Crofton complex, 11 to 15 percent slopes, eroded
Of	Ord fine sandy loam, 0 to 2 percent slopes
Pb	Pits and dumps
Pc	Platte loam, 0 to 2 percent slopes
Px	Platte-Inavale complex, channeled
So	Shell silt loam, occasionally flooded, 0 to 2 percent slopes
Sp	Shell silt loam, clayey substratum, 0 to 2 percent slopes
StD2	Steinauer clay loam, 6 to 11 percent slopes, eroded
StF2	Steinauer clay loam, 11 to 30 percent slopes, eroded
TmC2	Thurman-Moody complex, 2 to 6 percent slopes, eroded
TmD2	Thurman-Moody complex, 6 to 11 percent slopes, eroded
Zo	Zook silty clay loam, 0 to 1 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- County
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery — Davis Airstrip

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Other roads

ROAD EMBLEMS & DESIGNATIONS

- Federal — 410
- State — 52

RAILROAD

LEVEES

- Without road
- With road

DAMS

- Medium or small — water, w

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w

MISCELLANEOUS WATER FEATURES

- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — MoC, NpD2

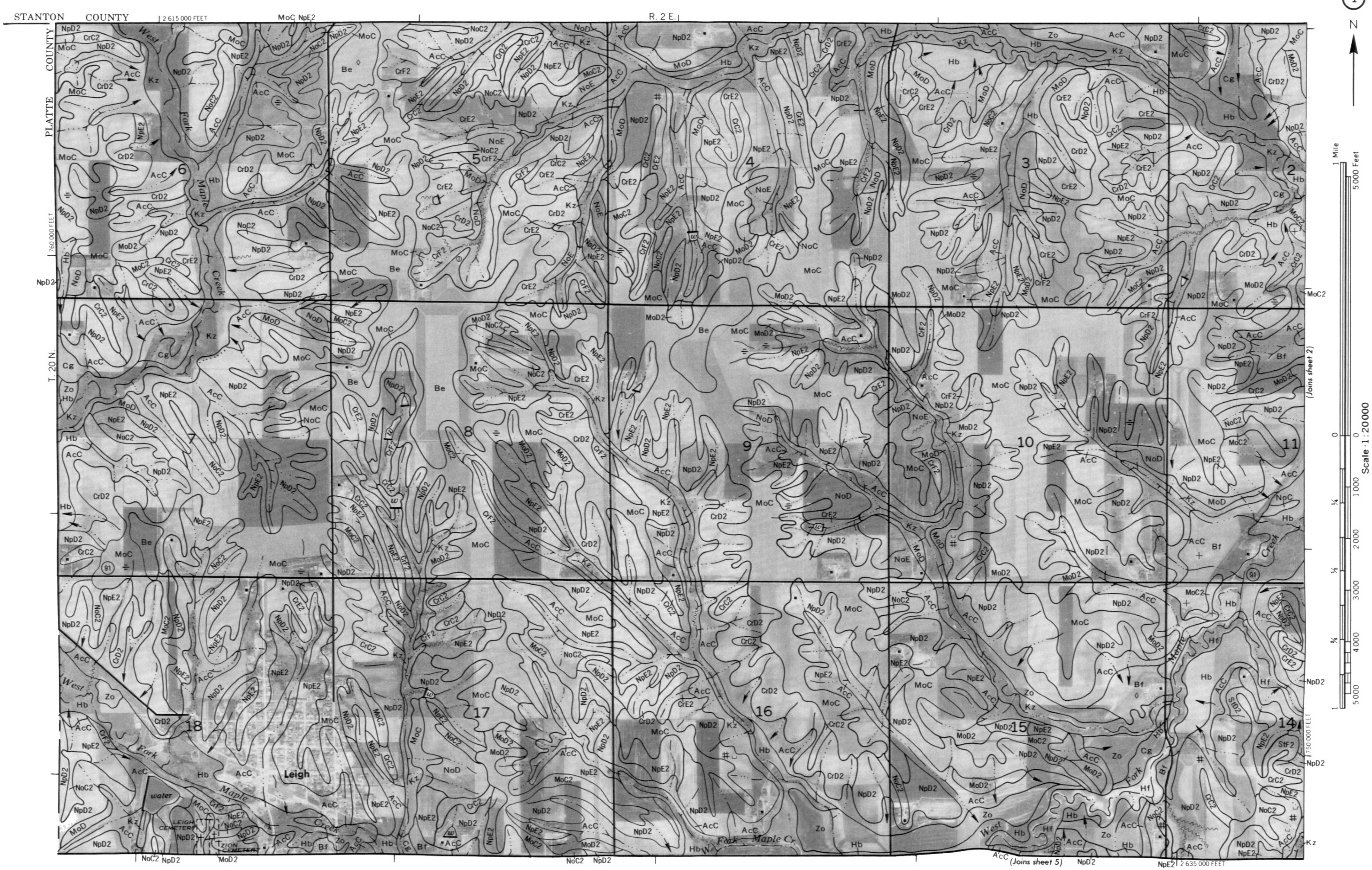
SHORT STEEP SLOPE

GULLY

DEPRESSION

MISCELLANEOUS

- Saline spot
- Sandy spot
- Severely eroded spot
- Calcareous spot
- Sanitary landfill up to 4 acres in size
- Glacial till spot
- Reddish brown silty spot



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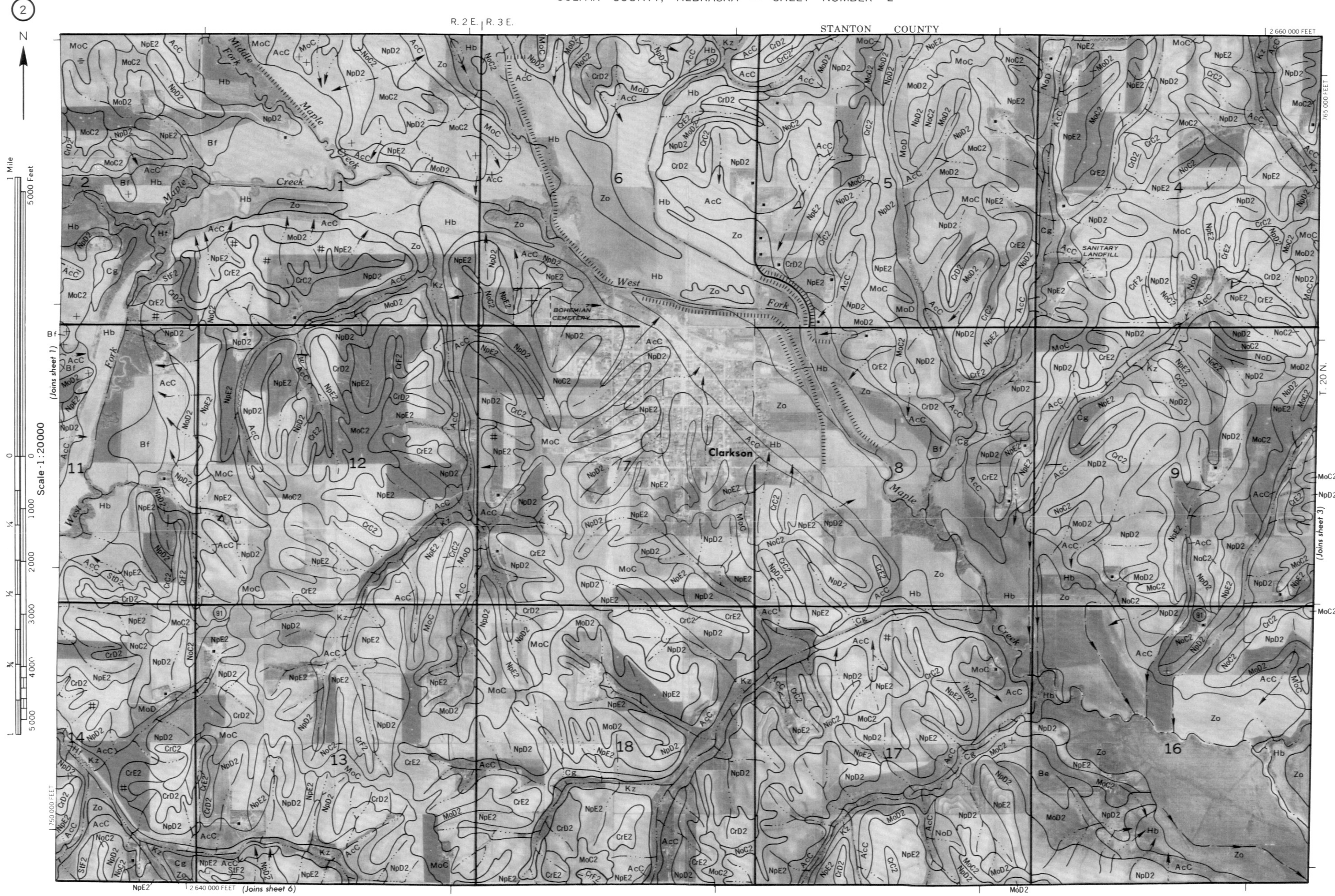

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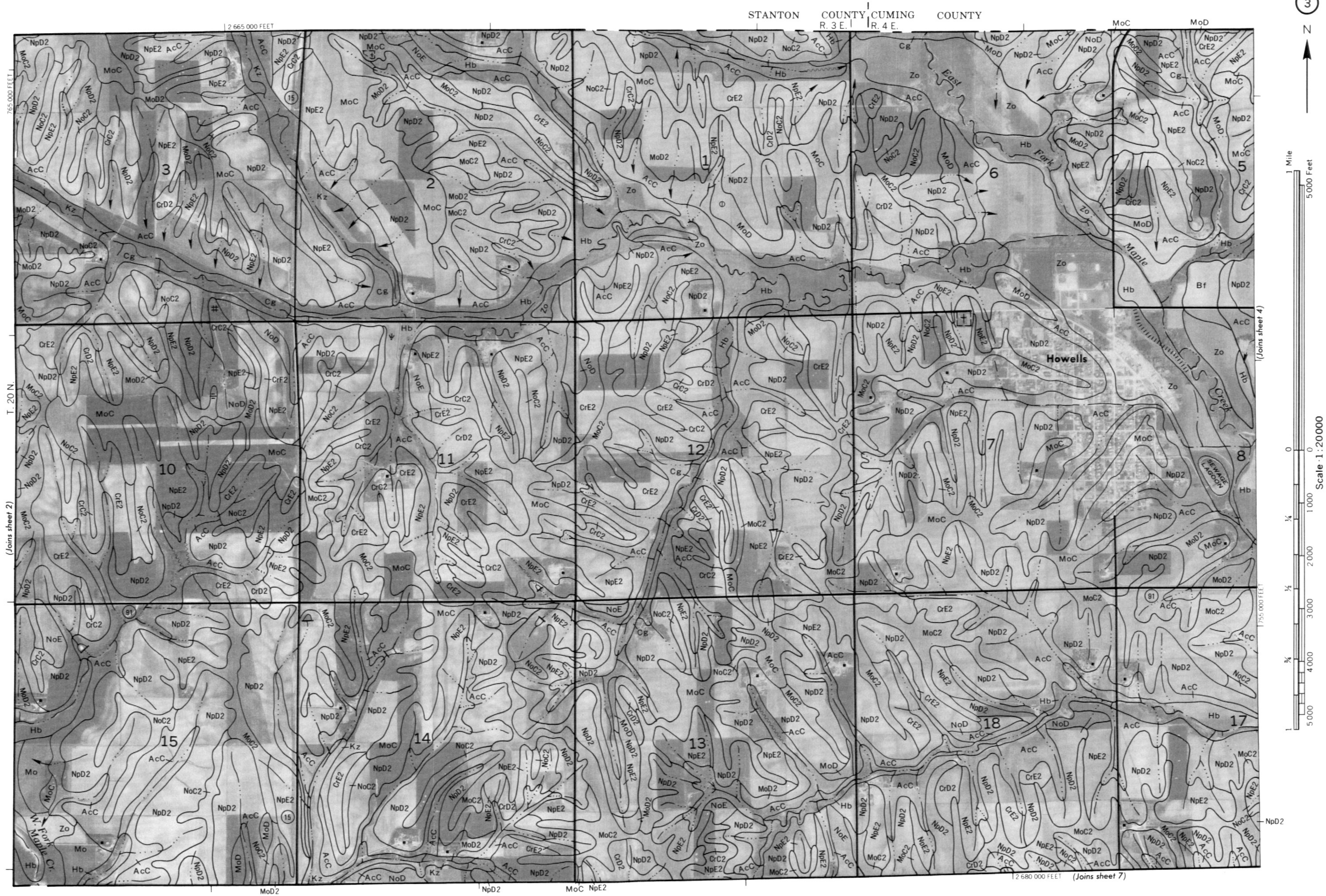

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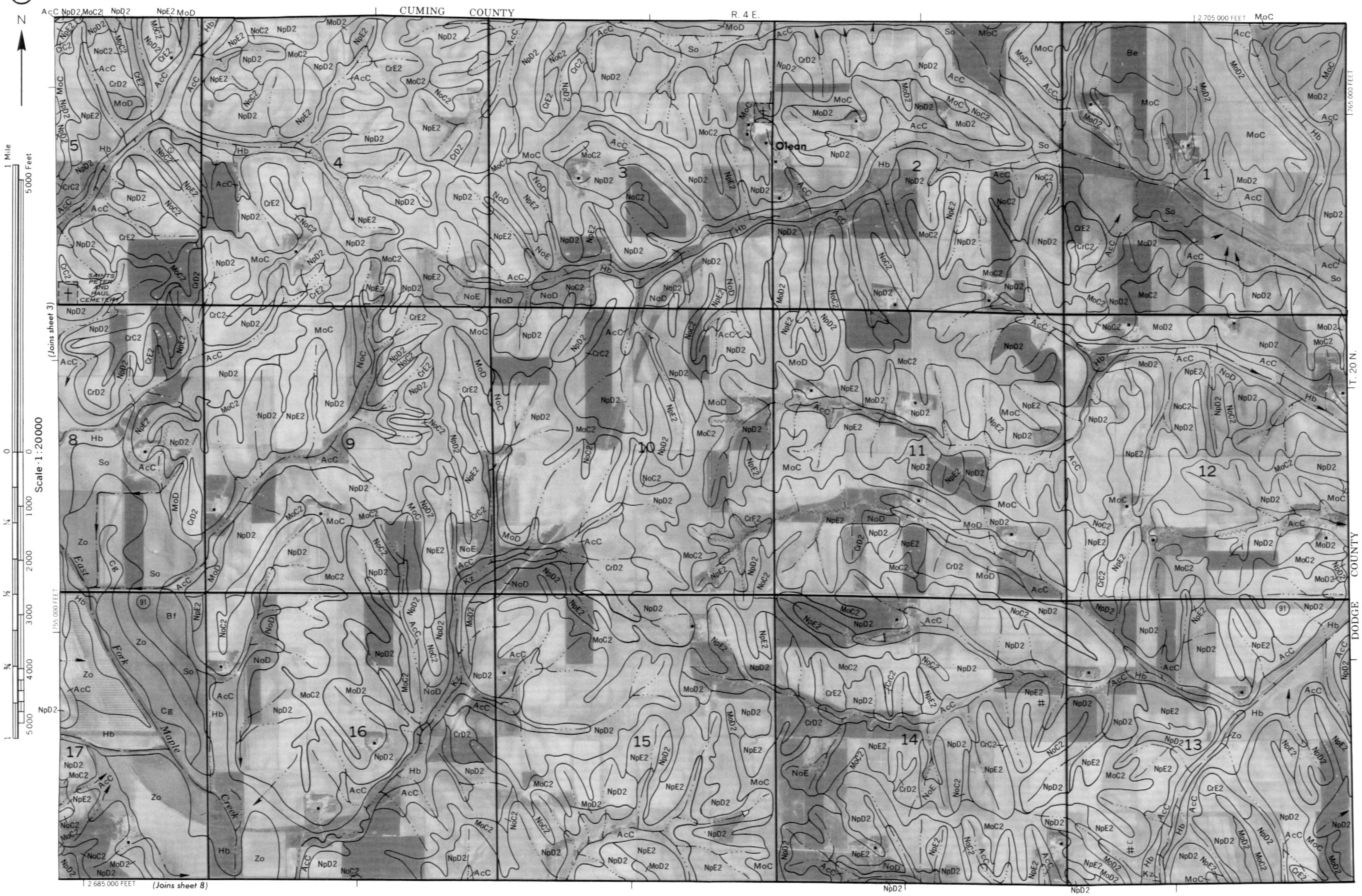

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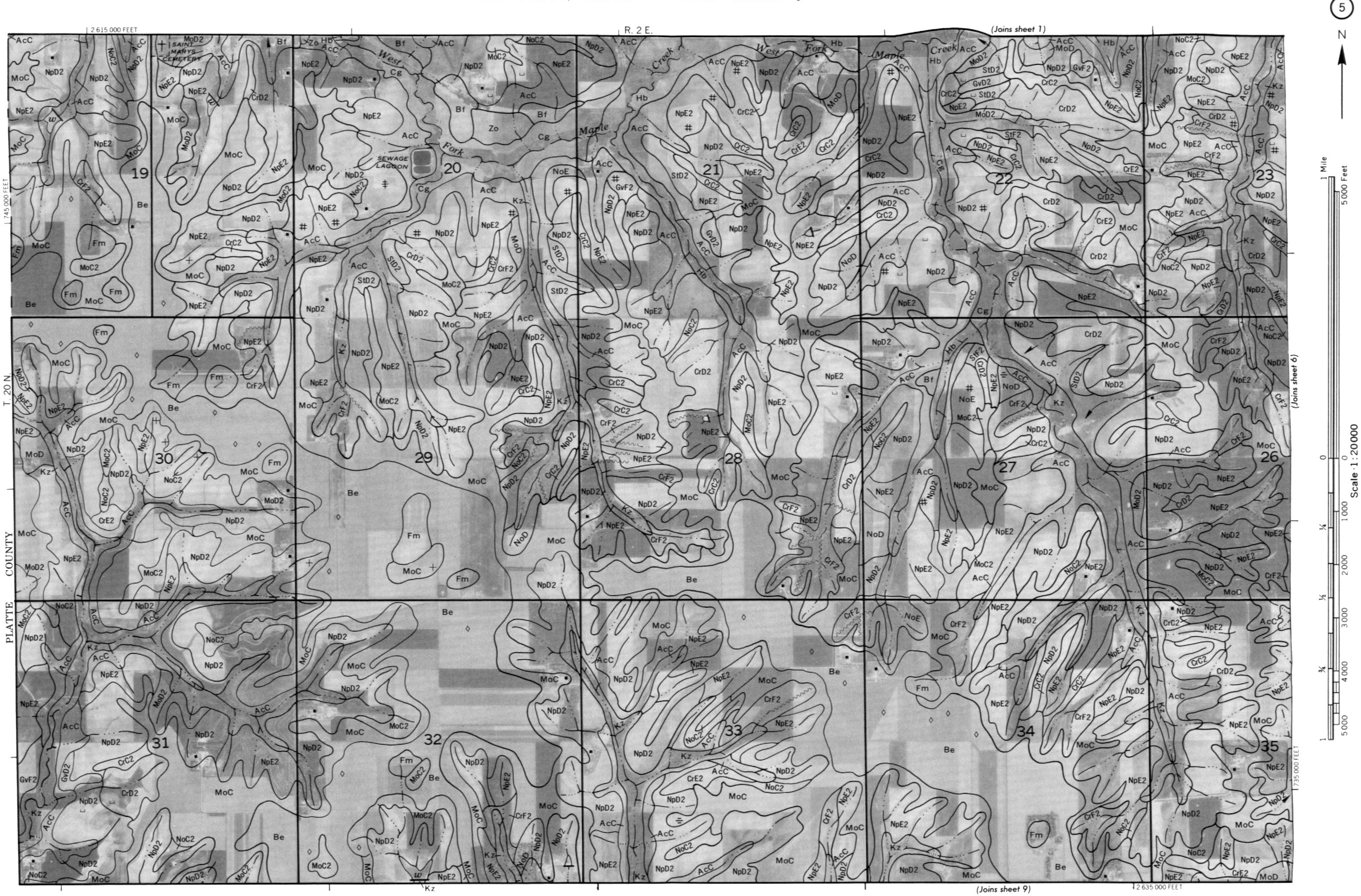

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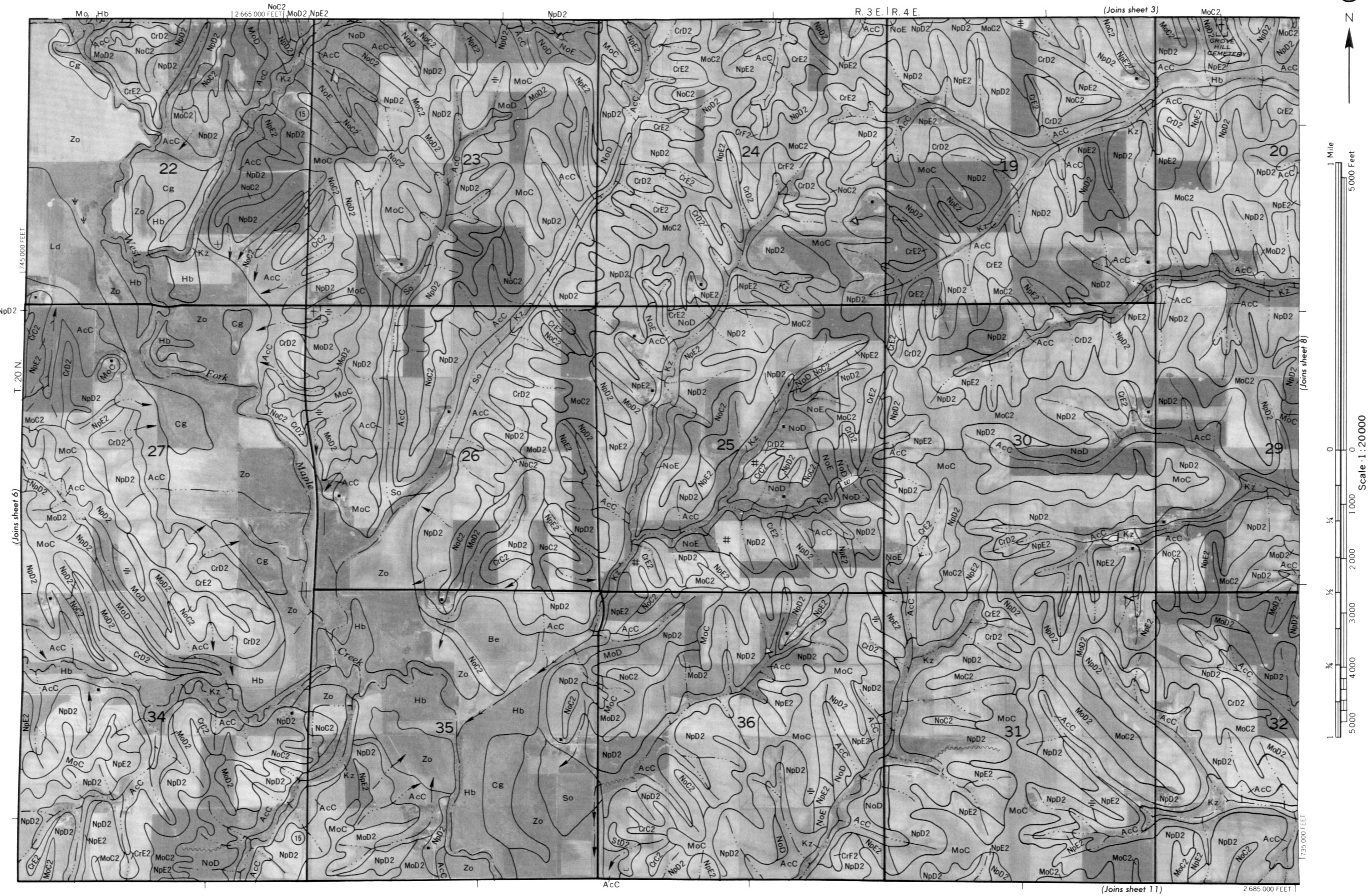

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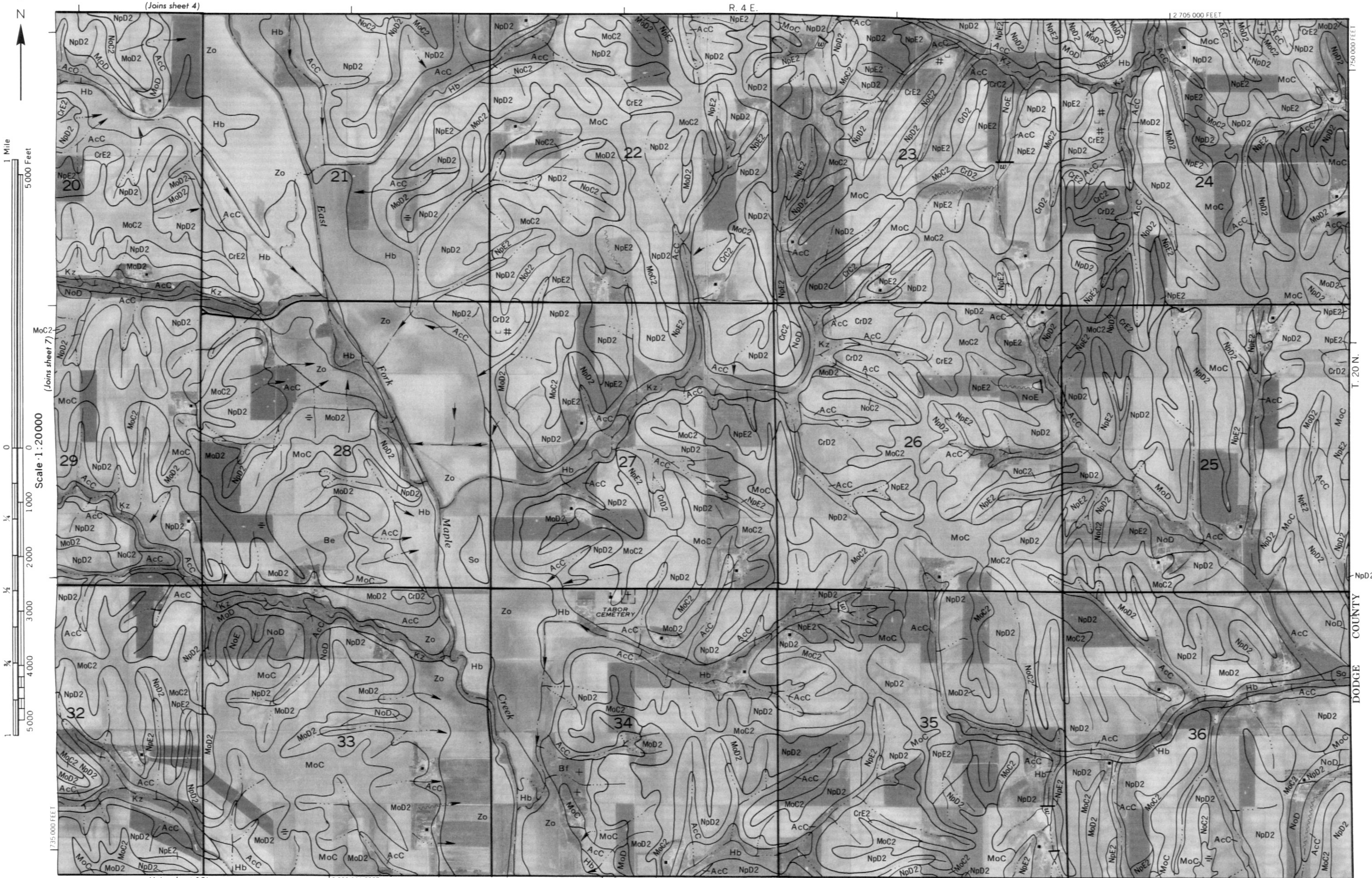

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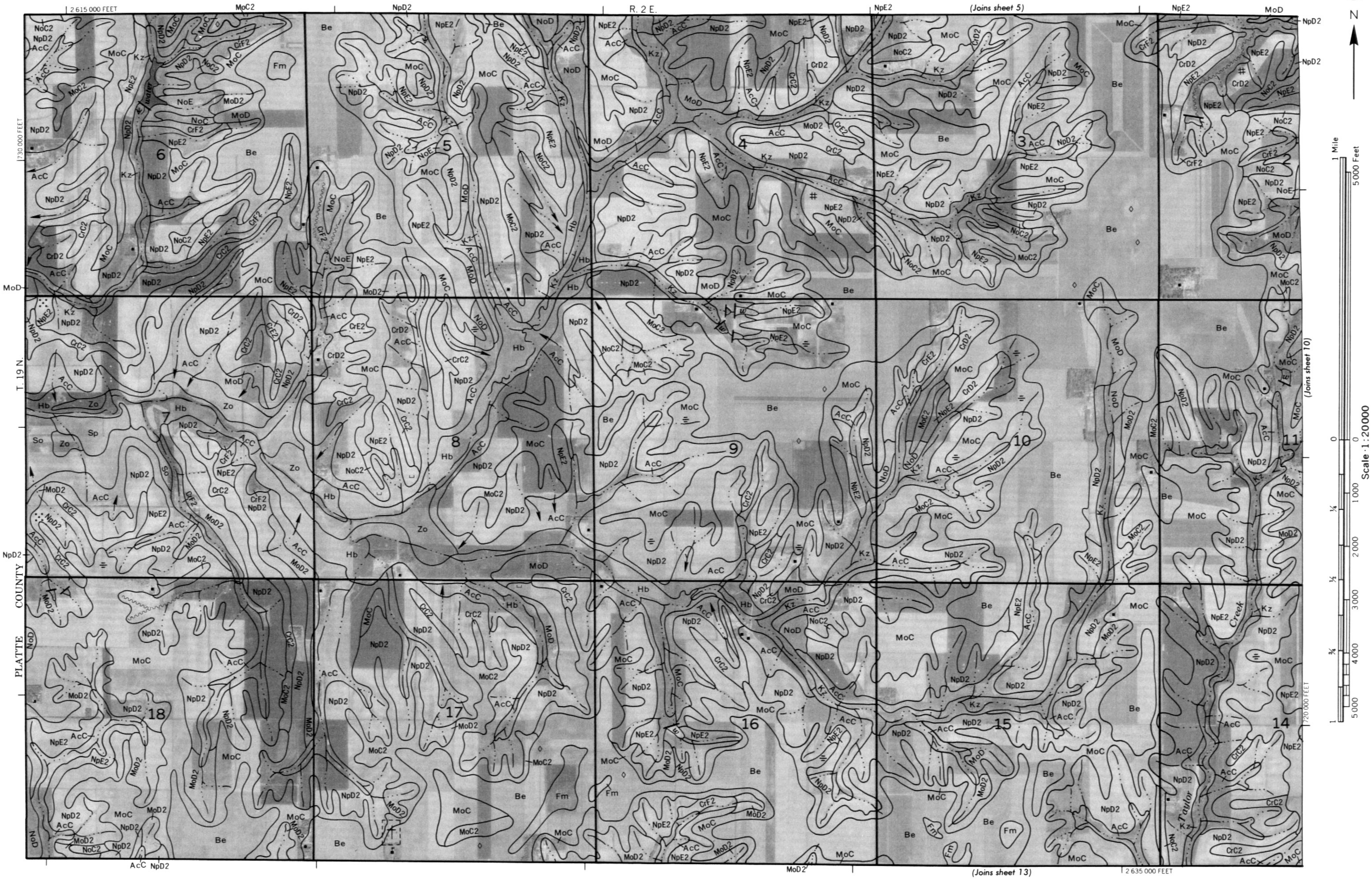

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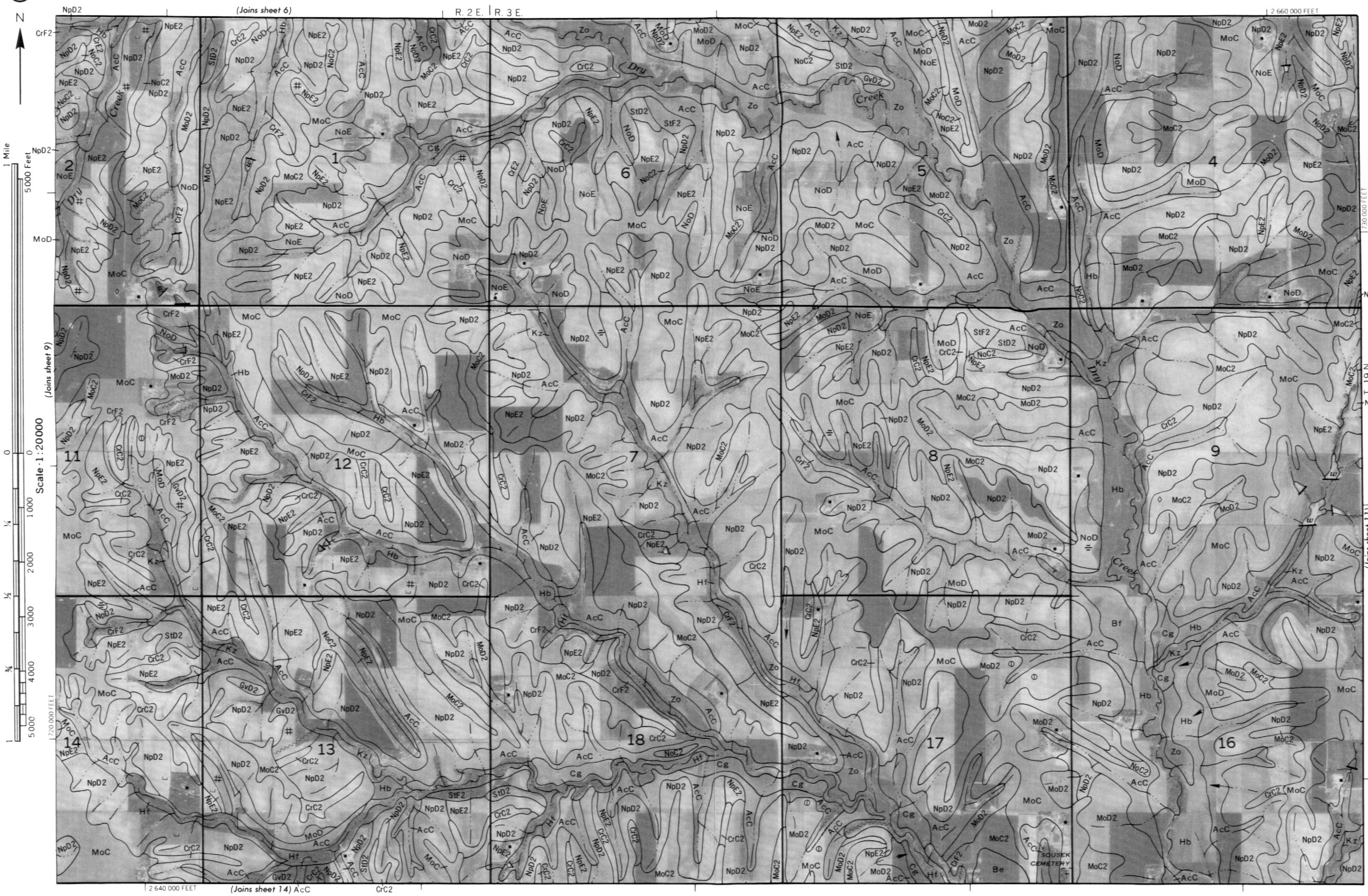

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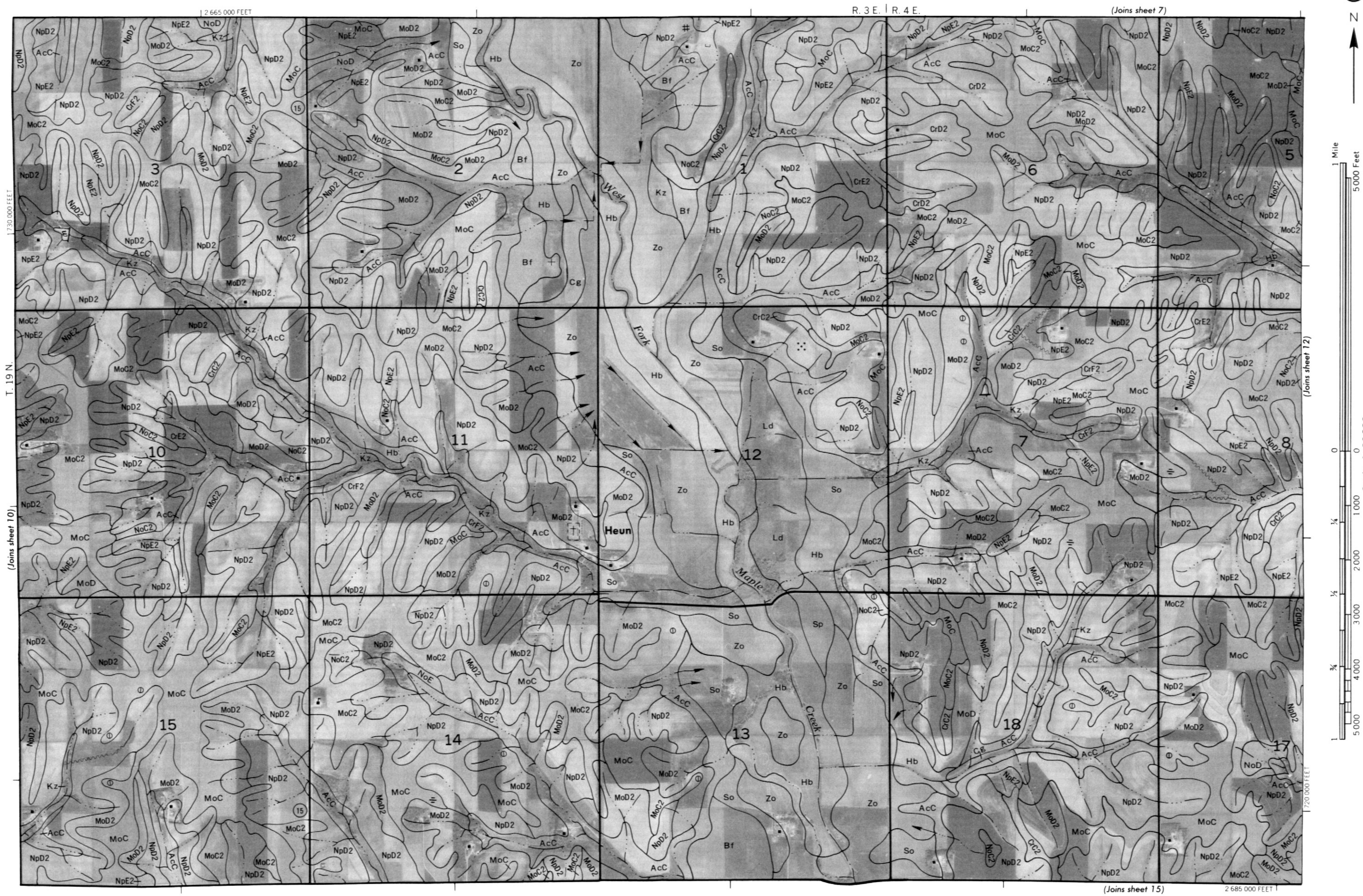

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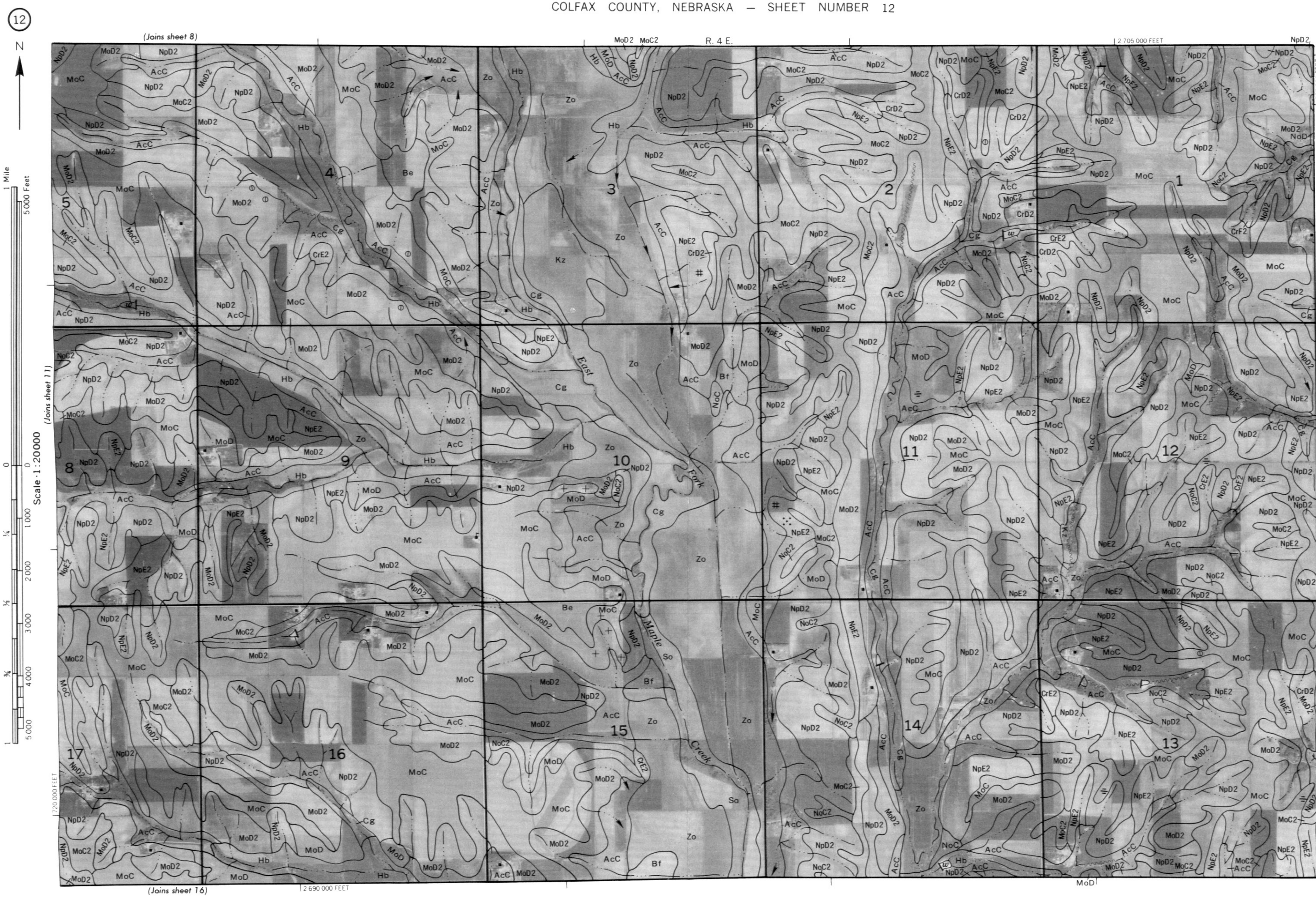

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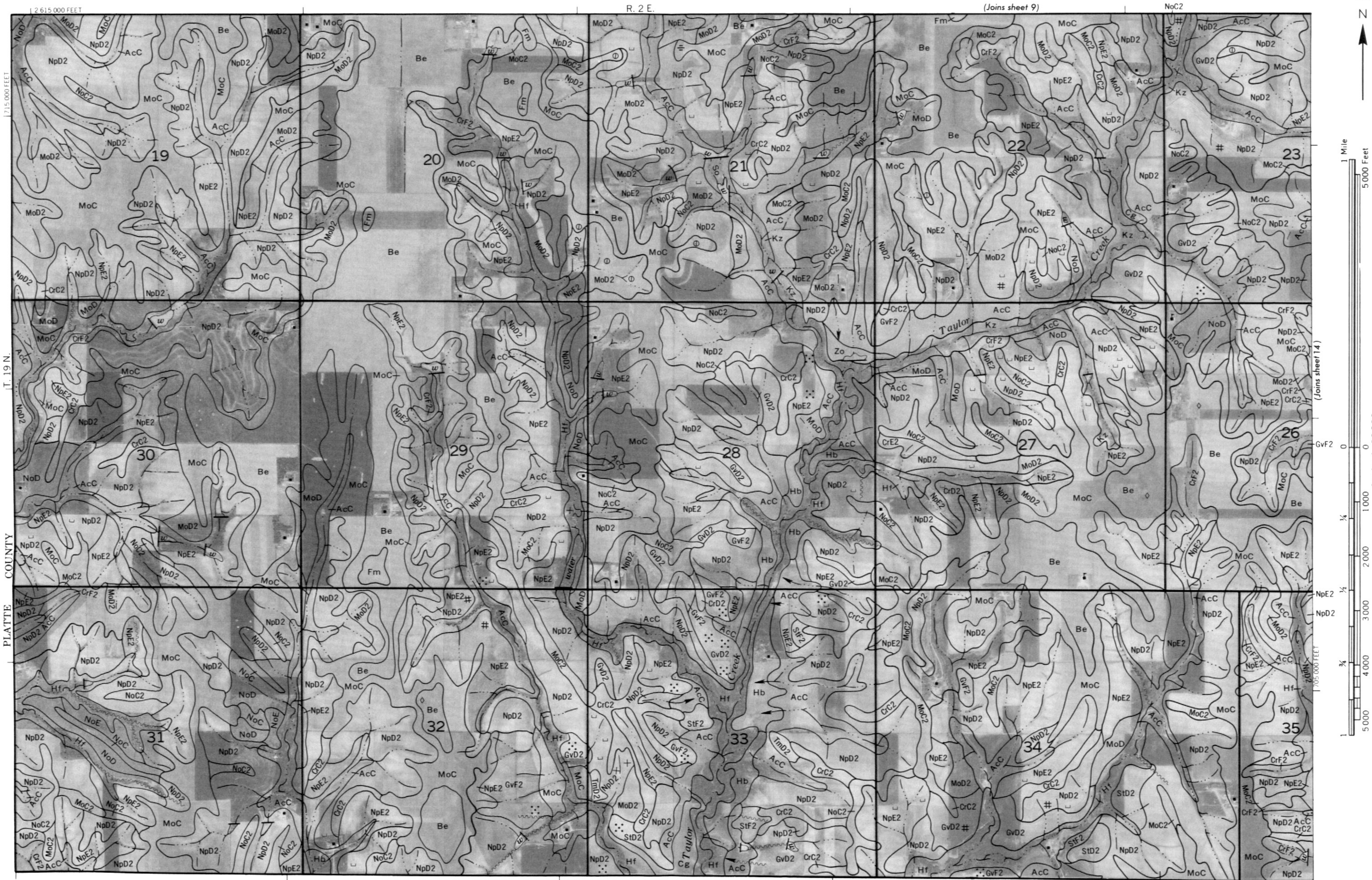

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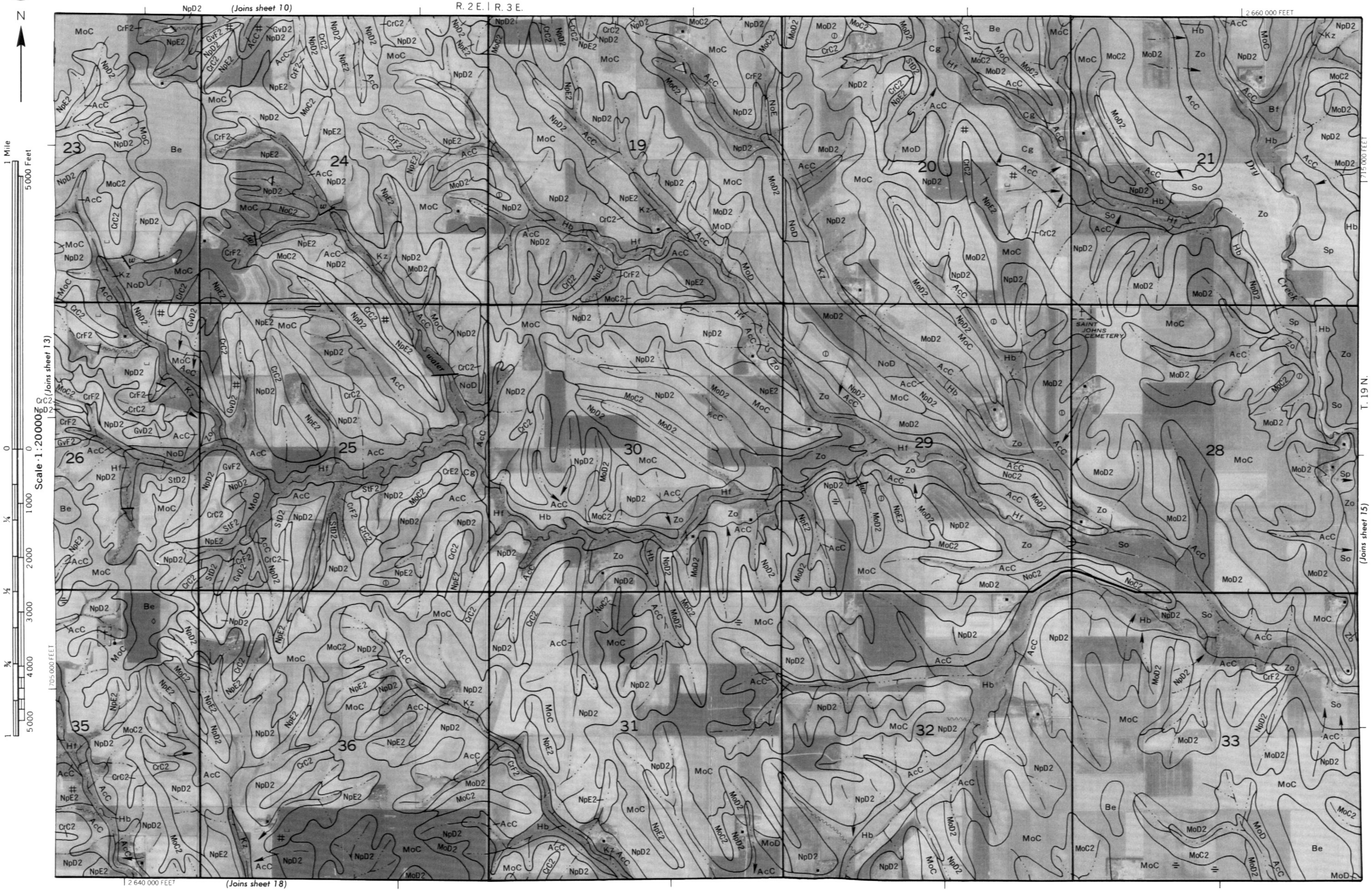

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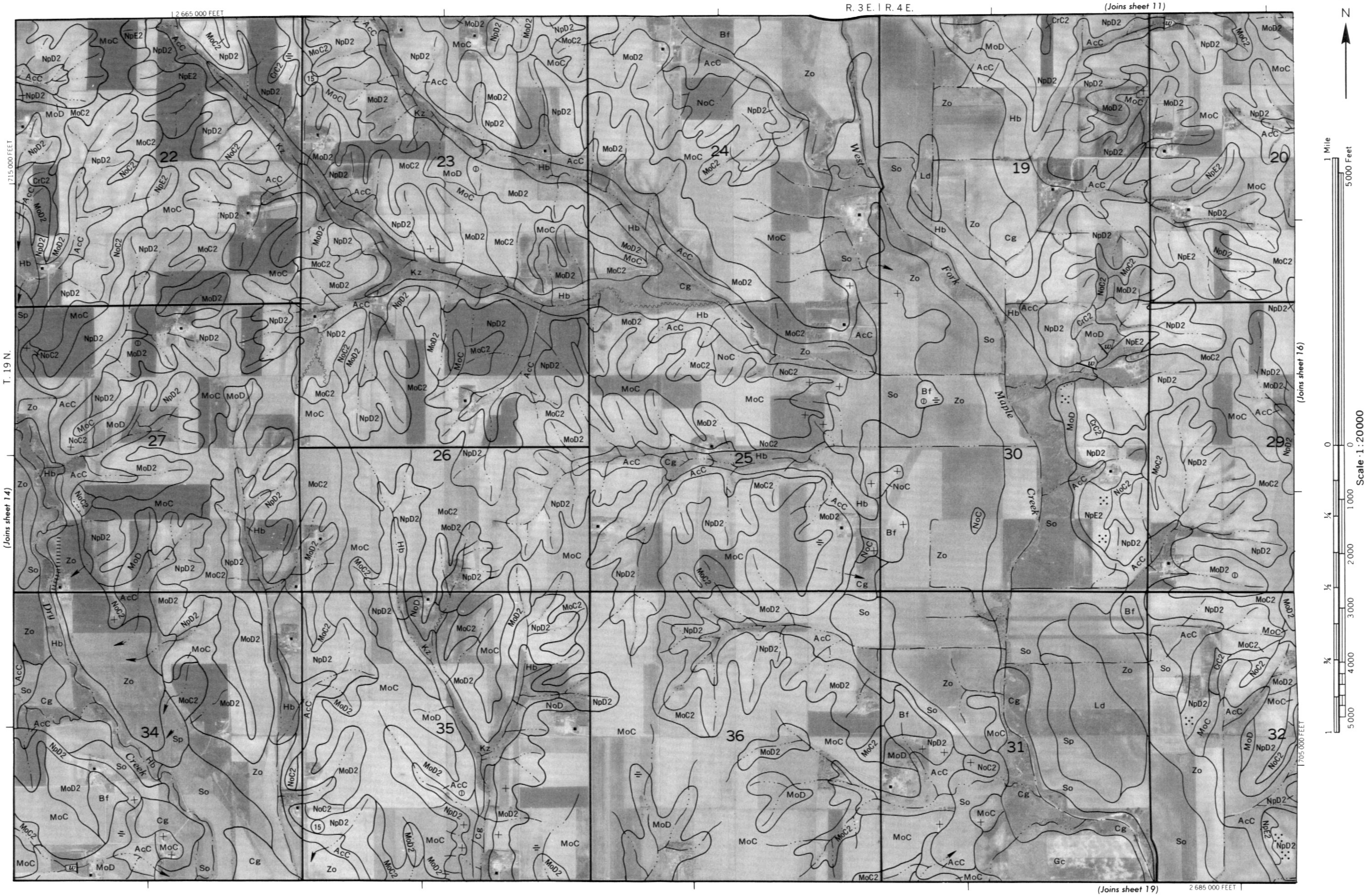
15



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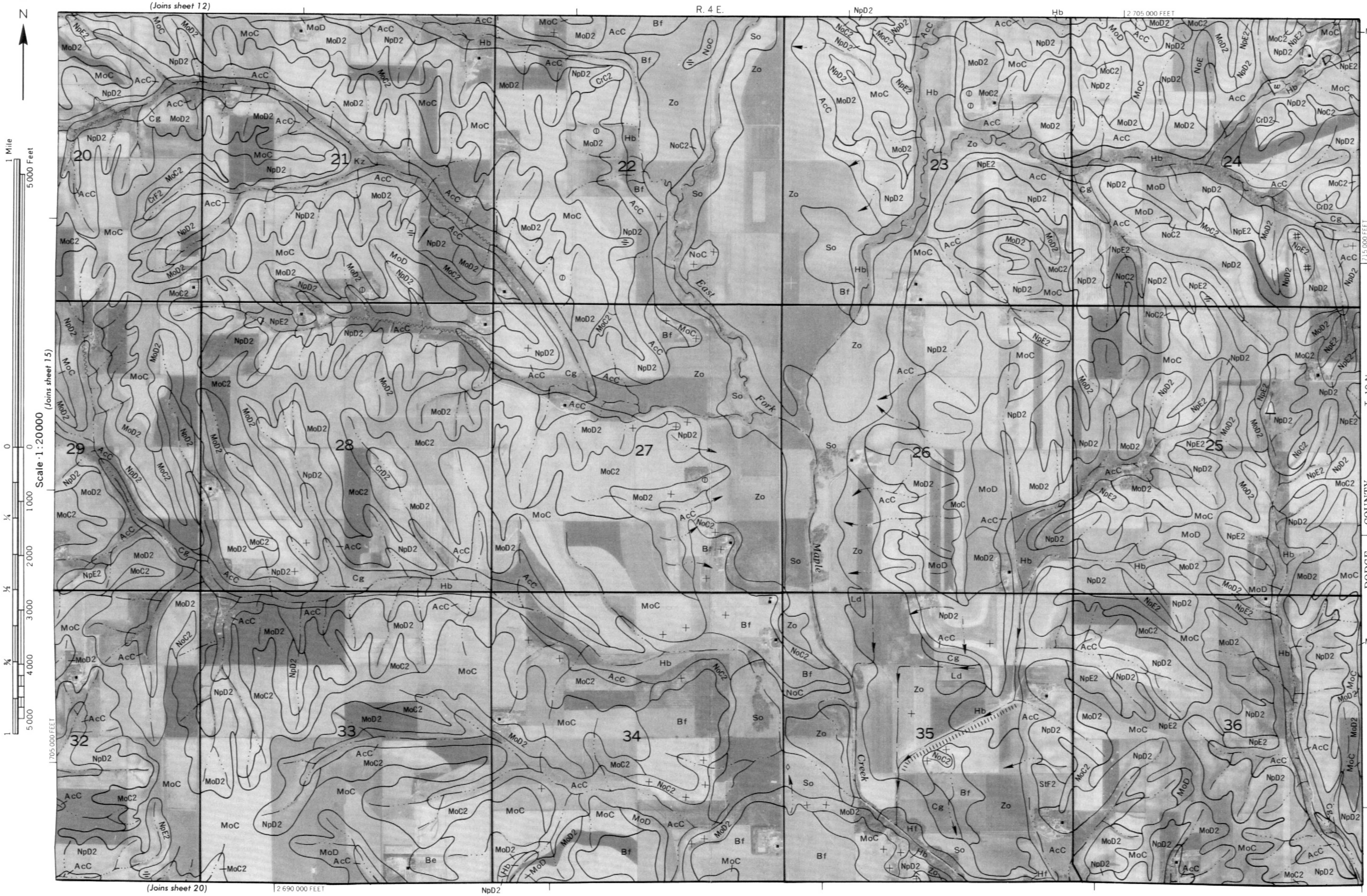

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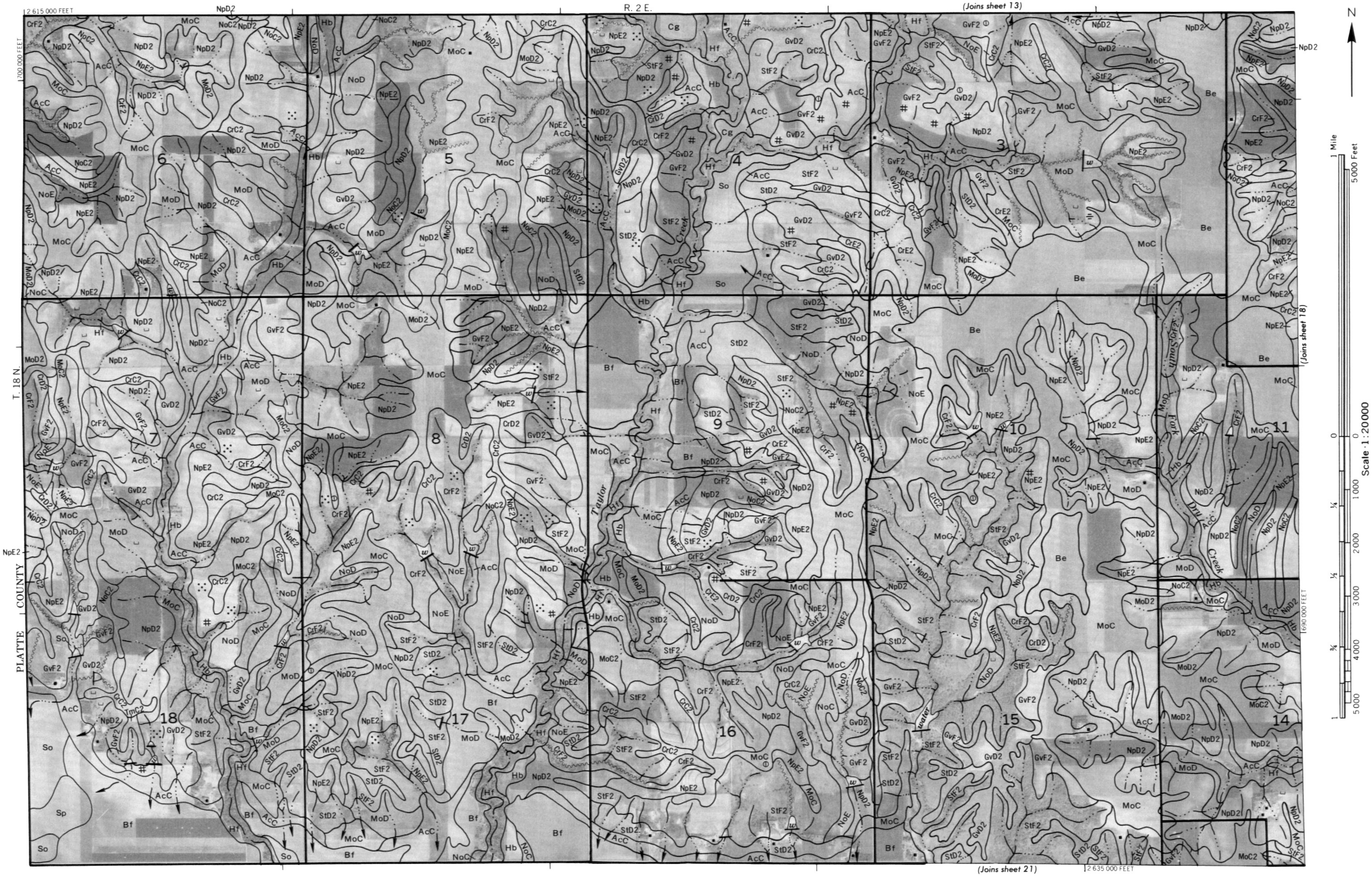
17



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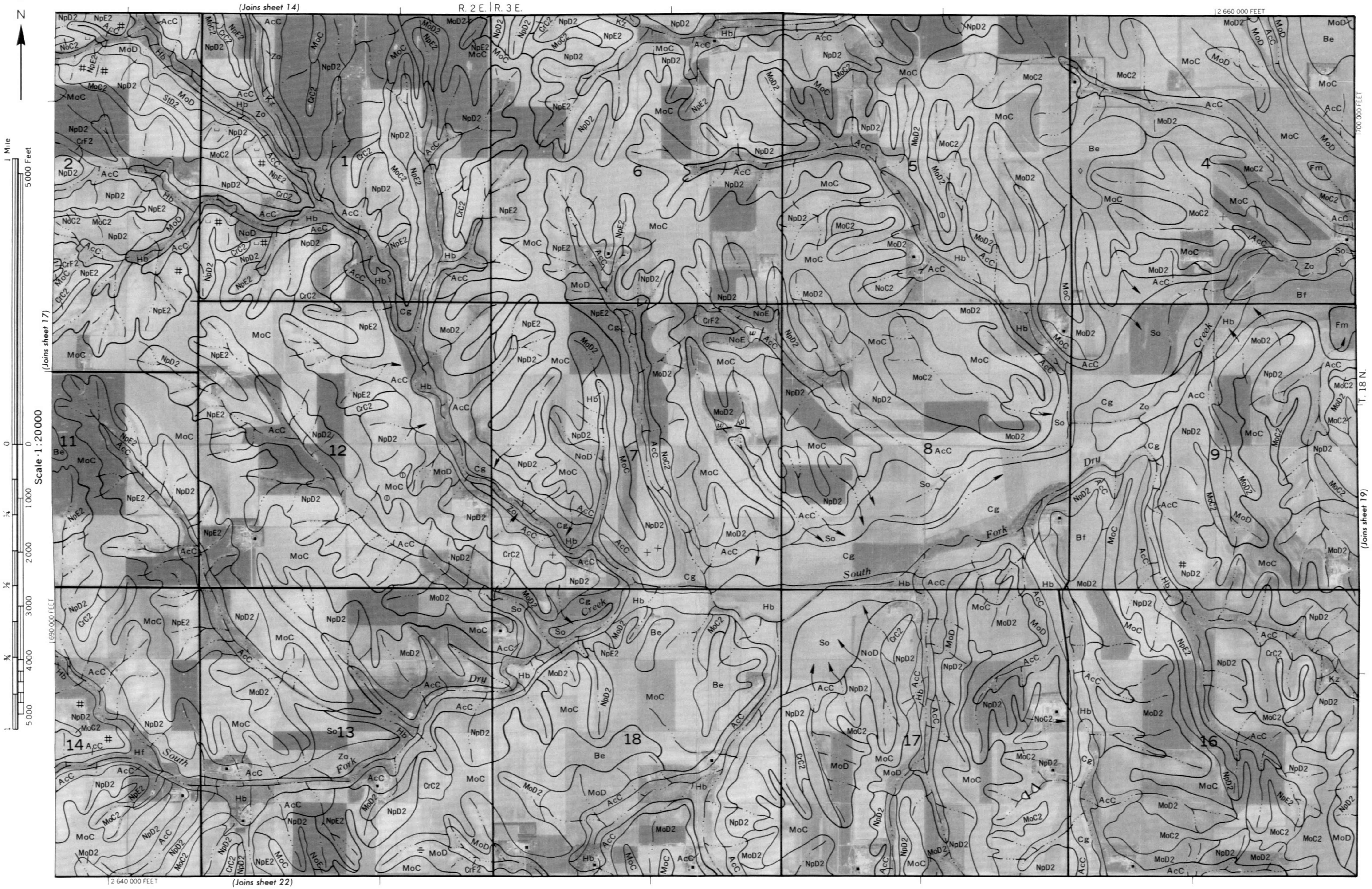

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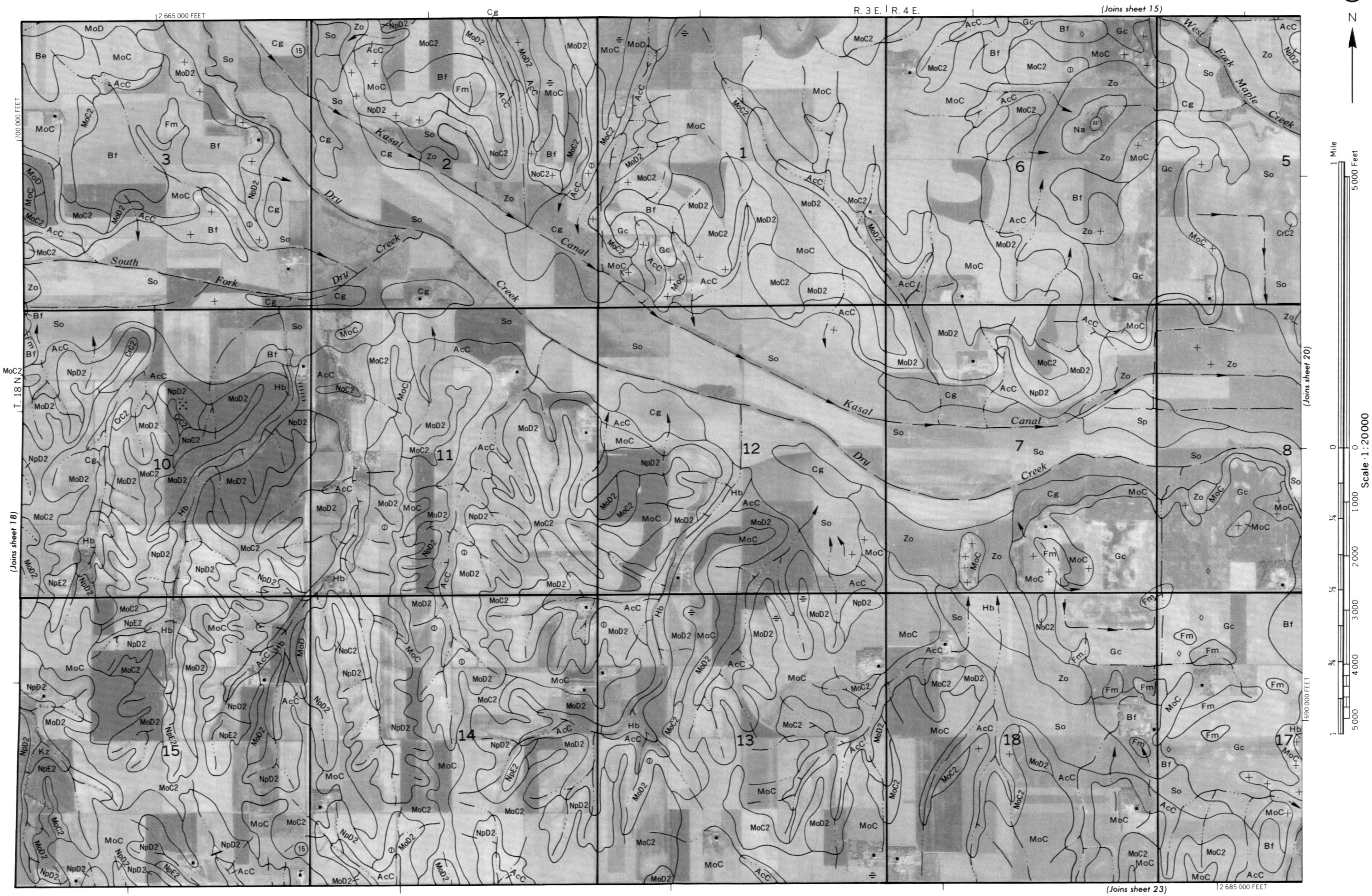

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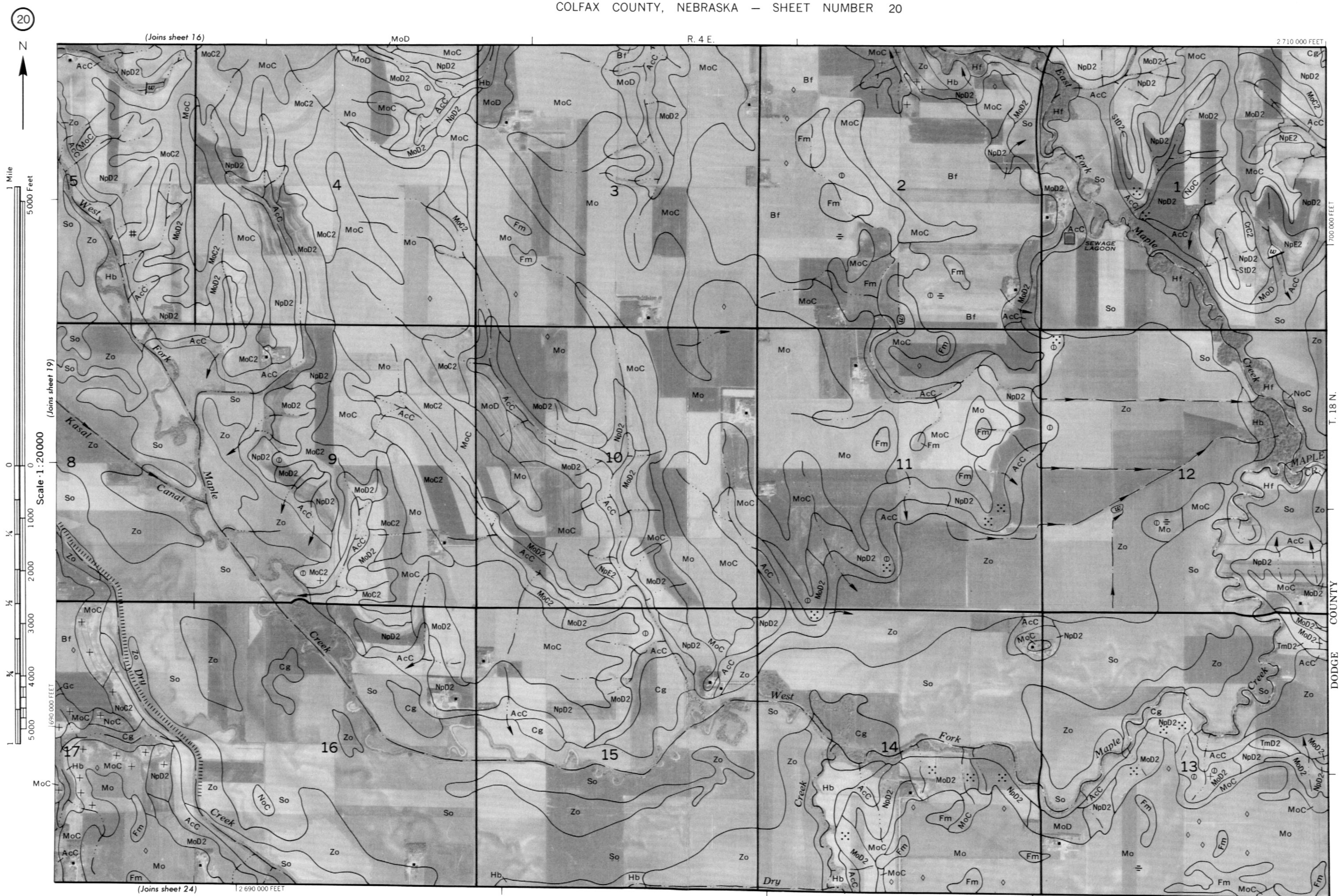

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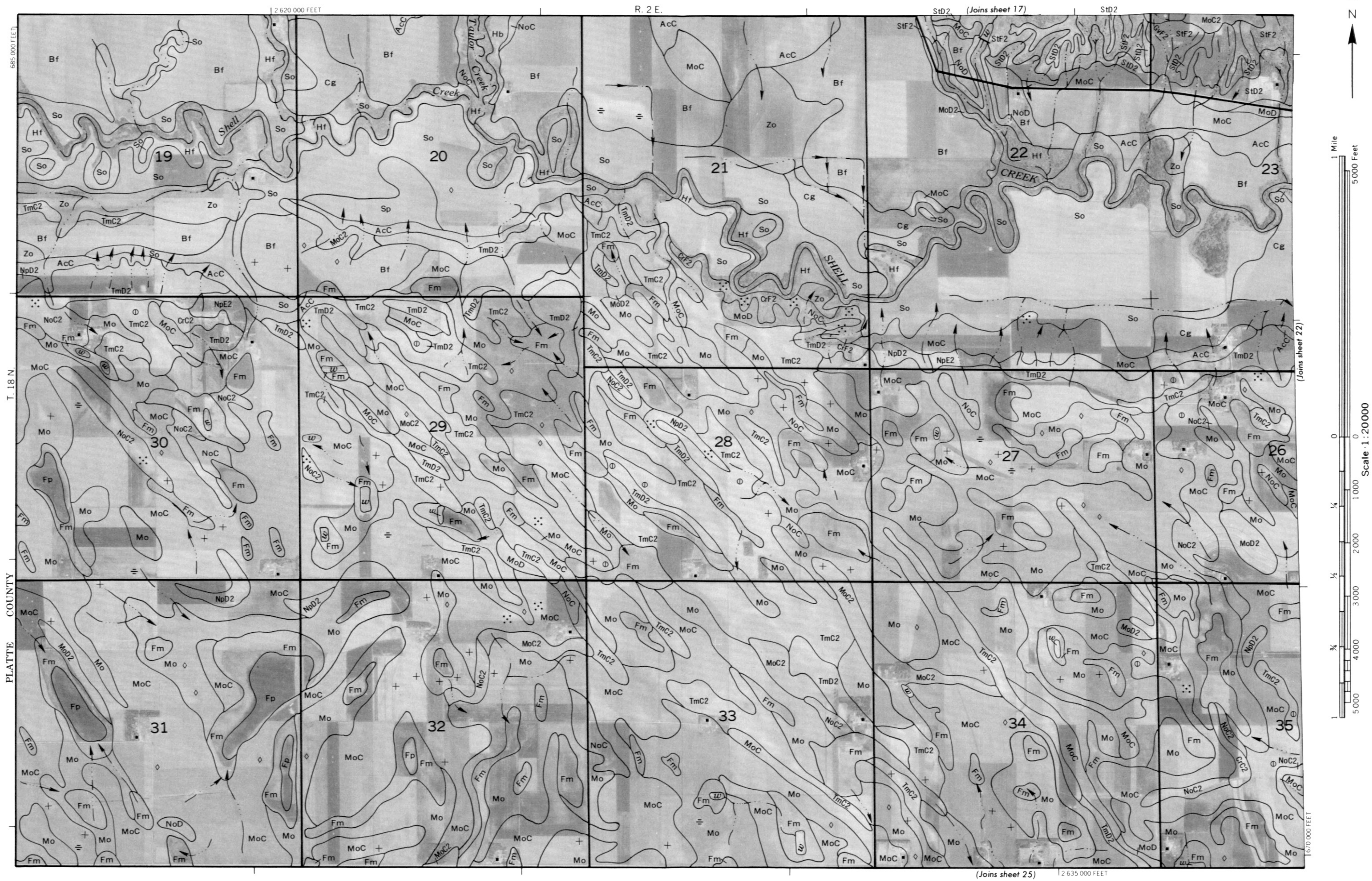
21



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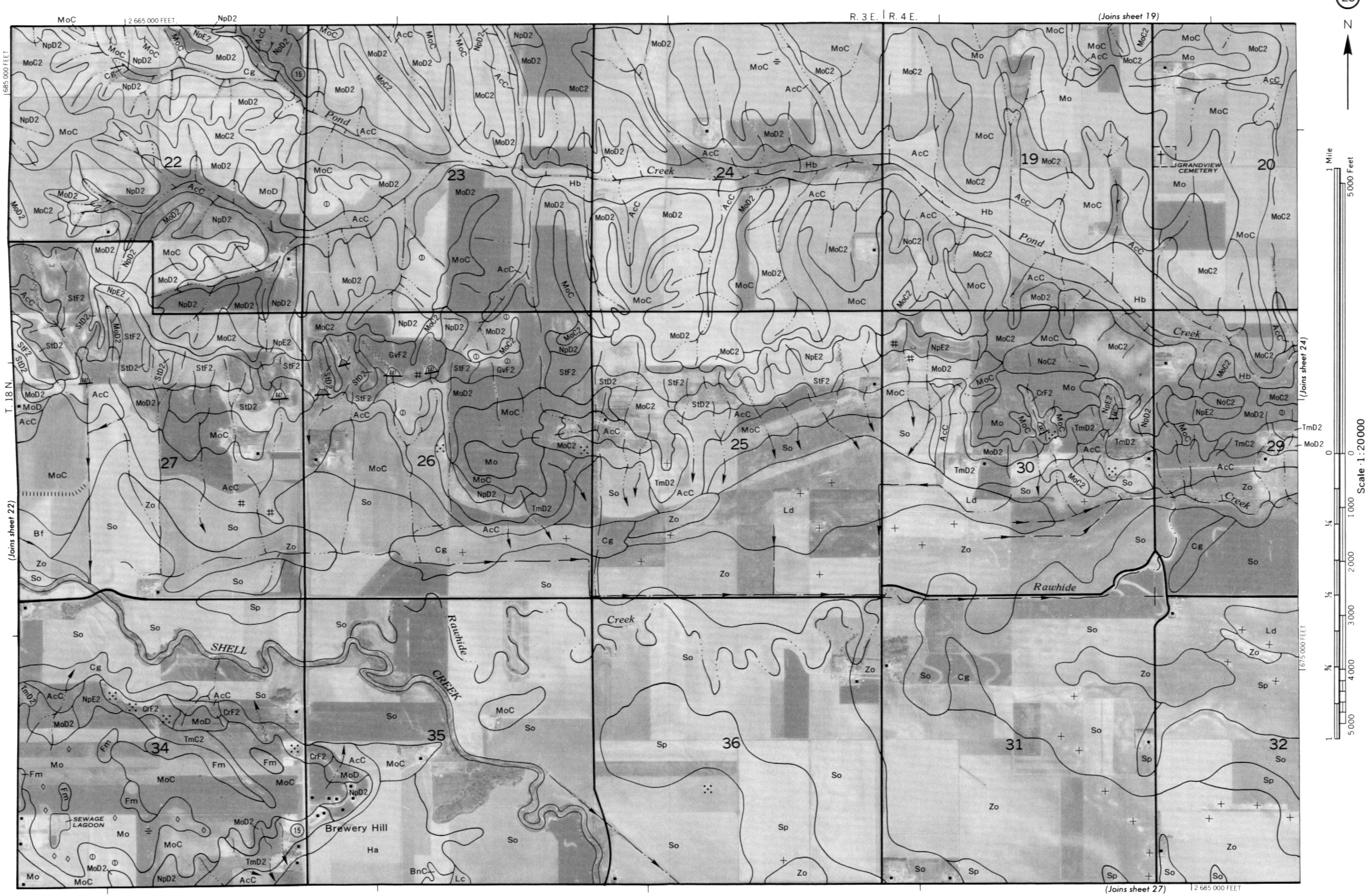

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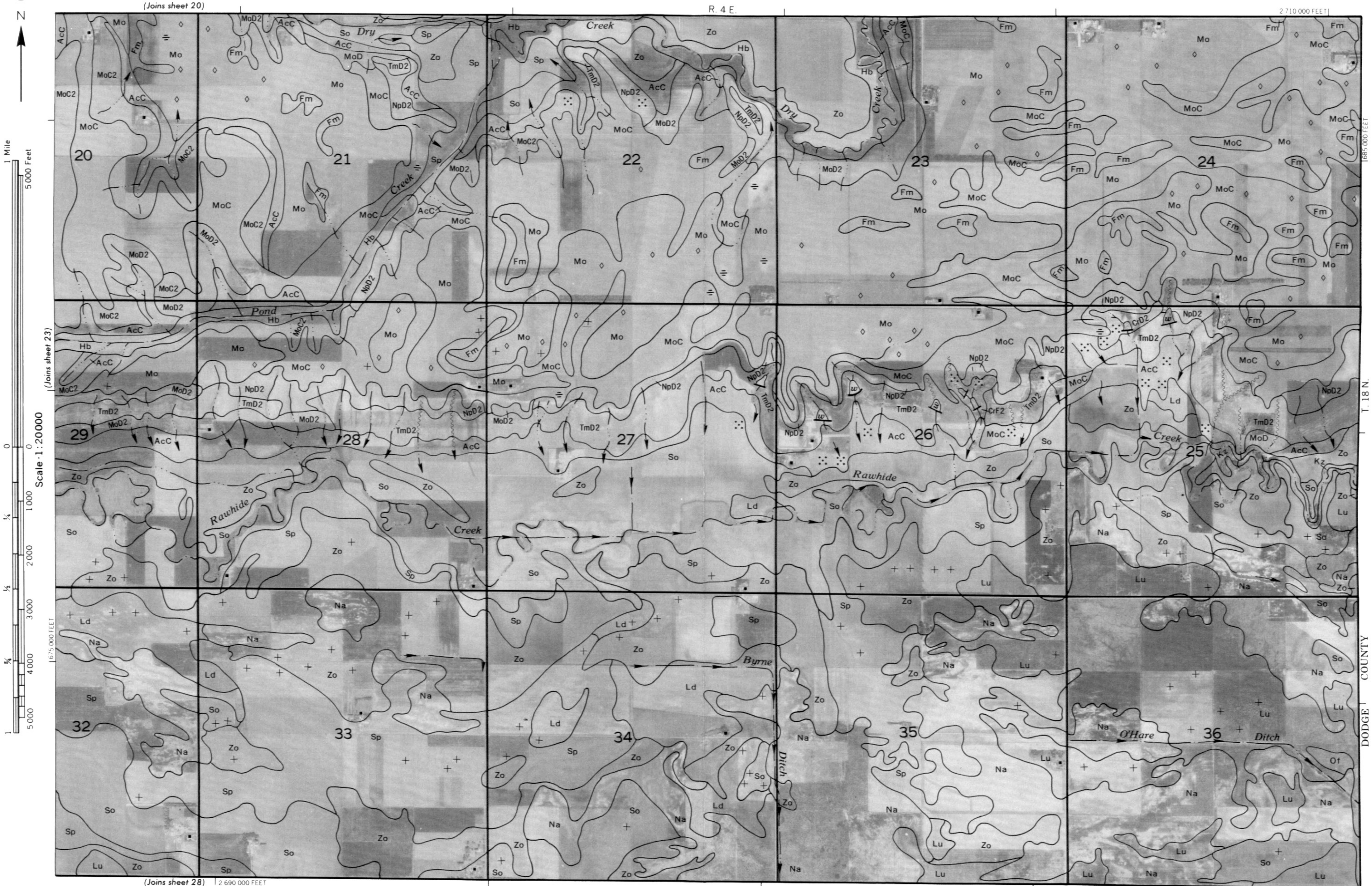
COLFAX COUNTY, NEBRASKA — SHEET NUMBER 24



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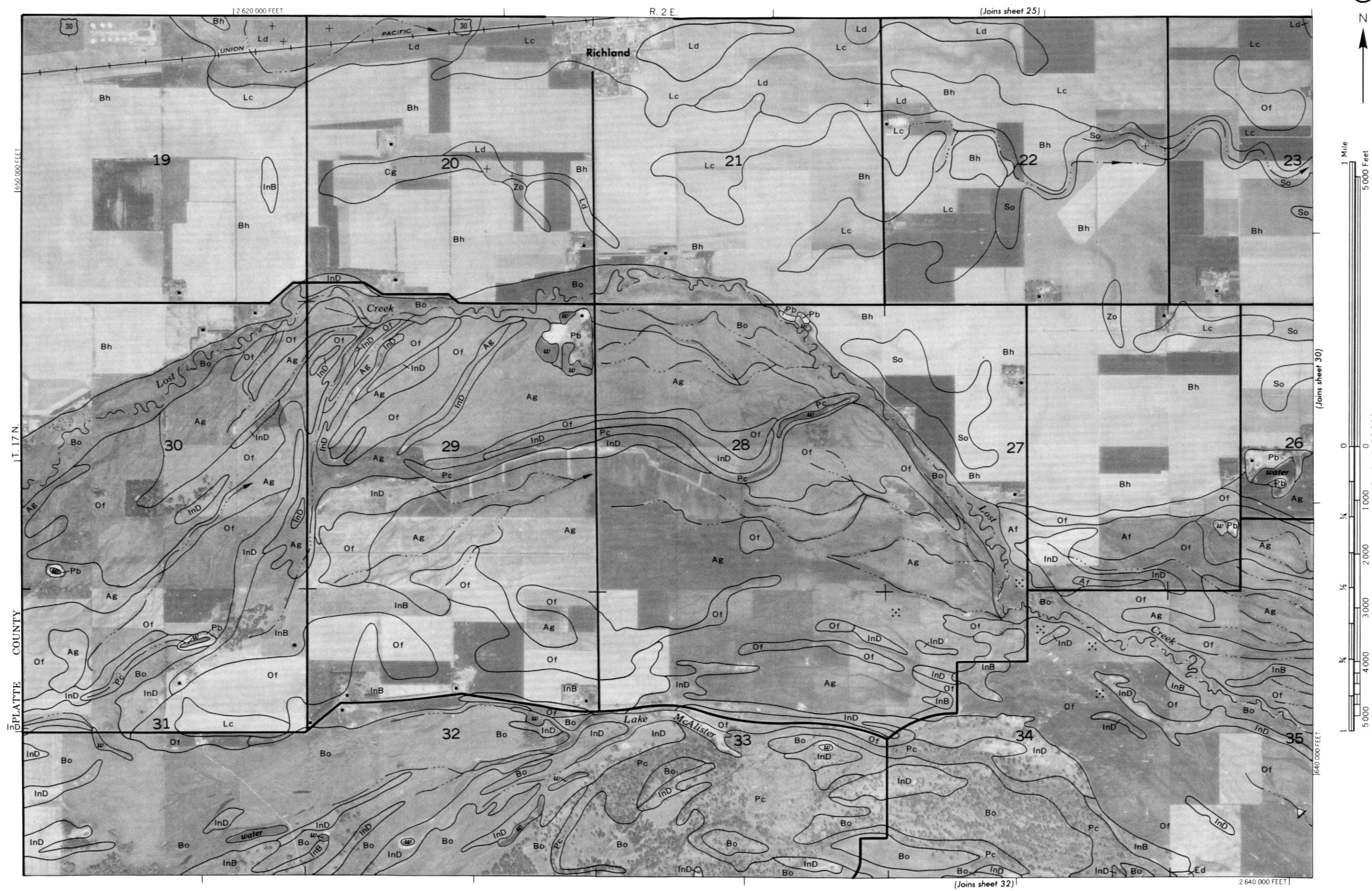

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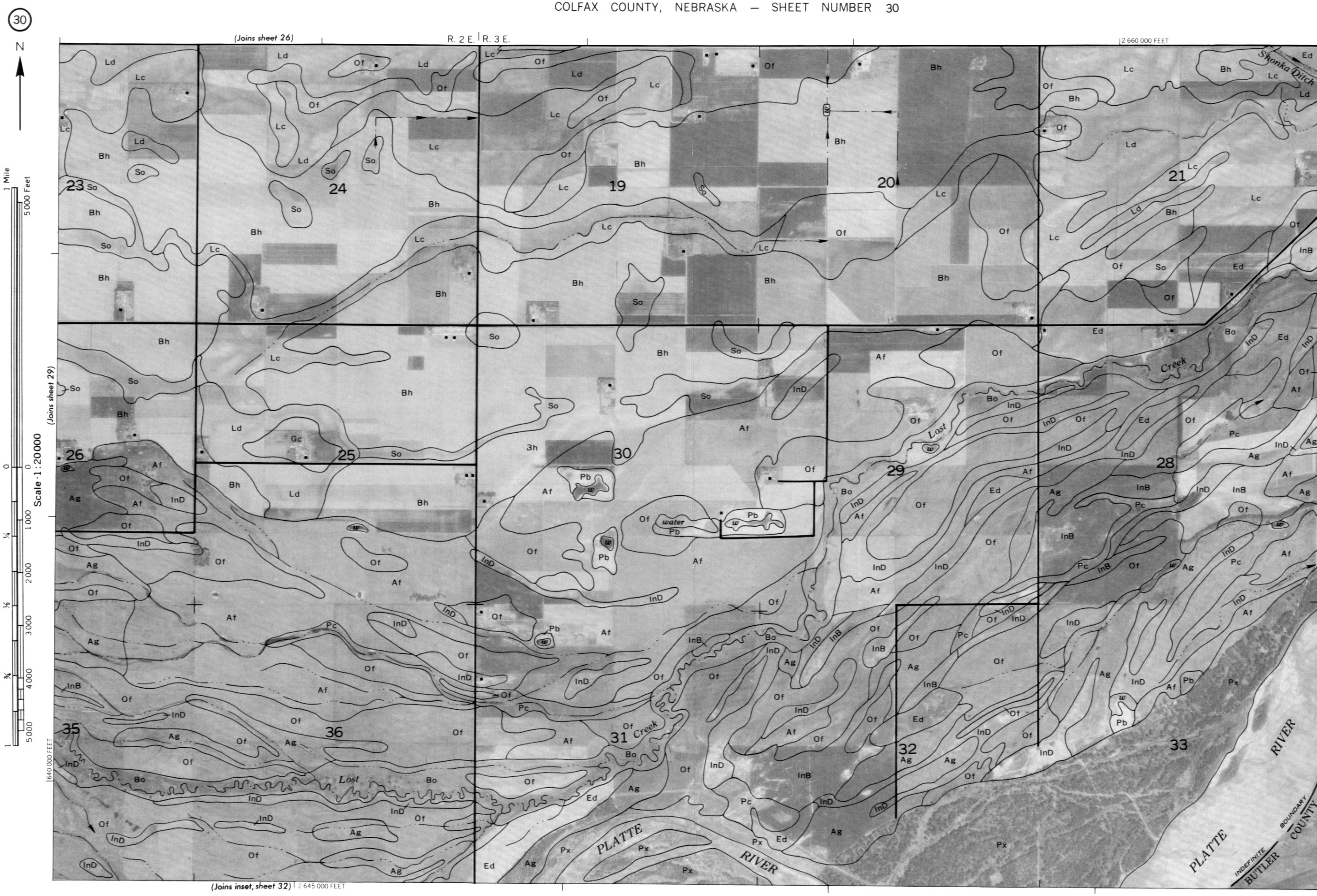

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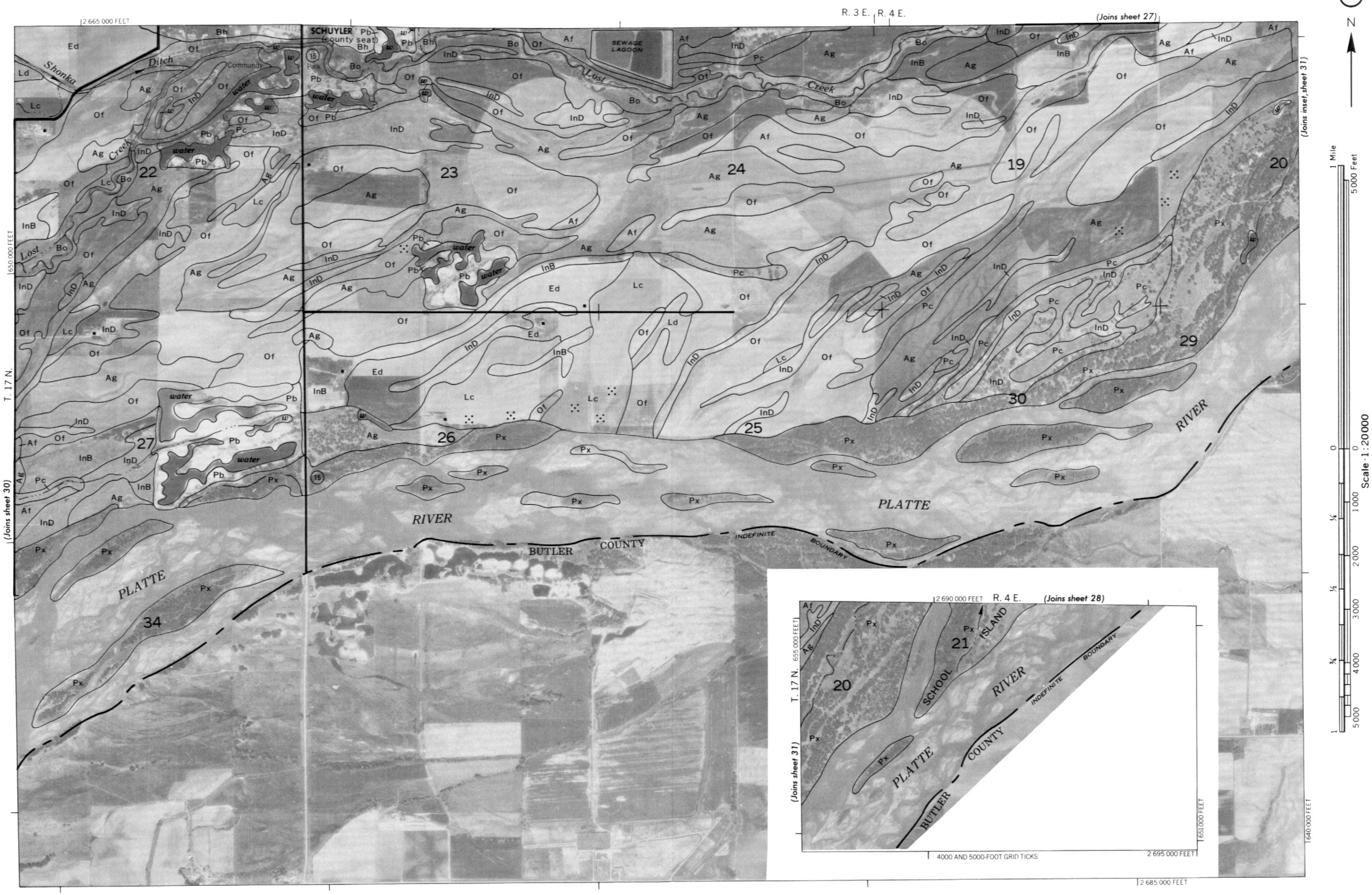

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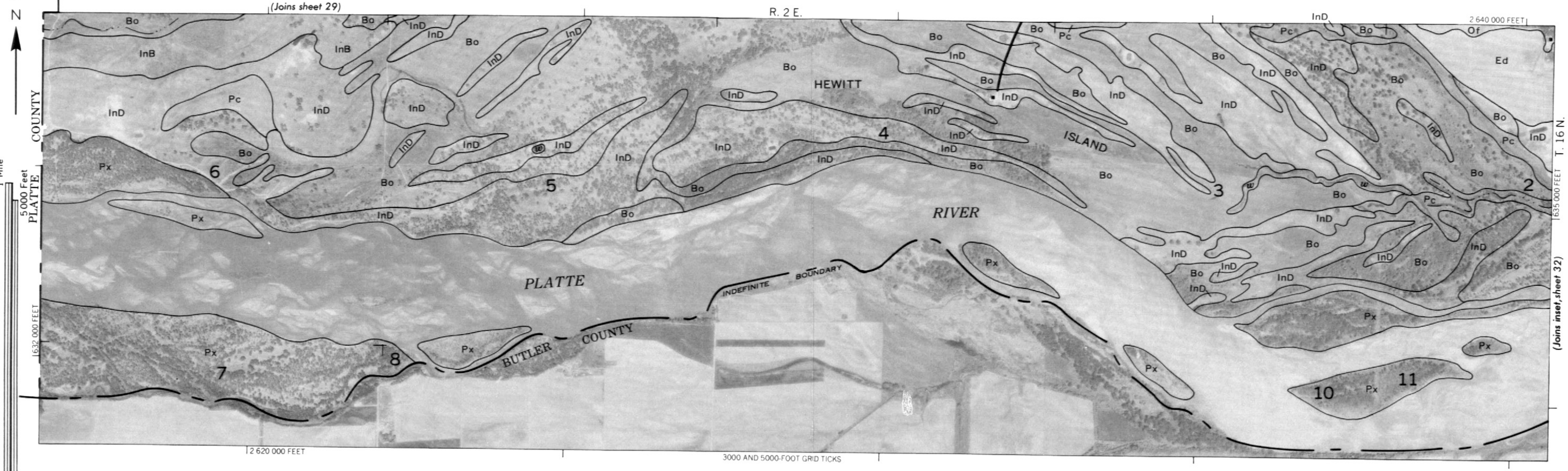

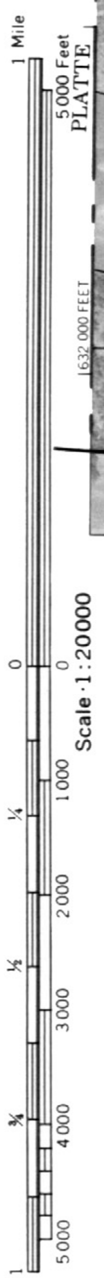

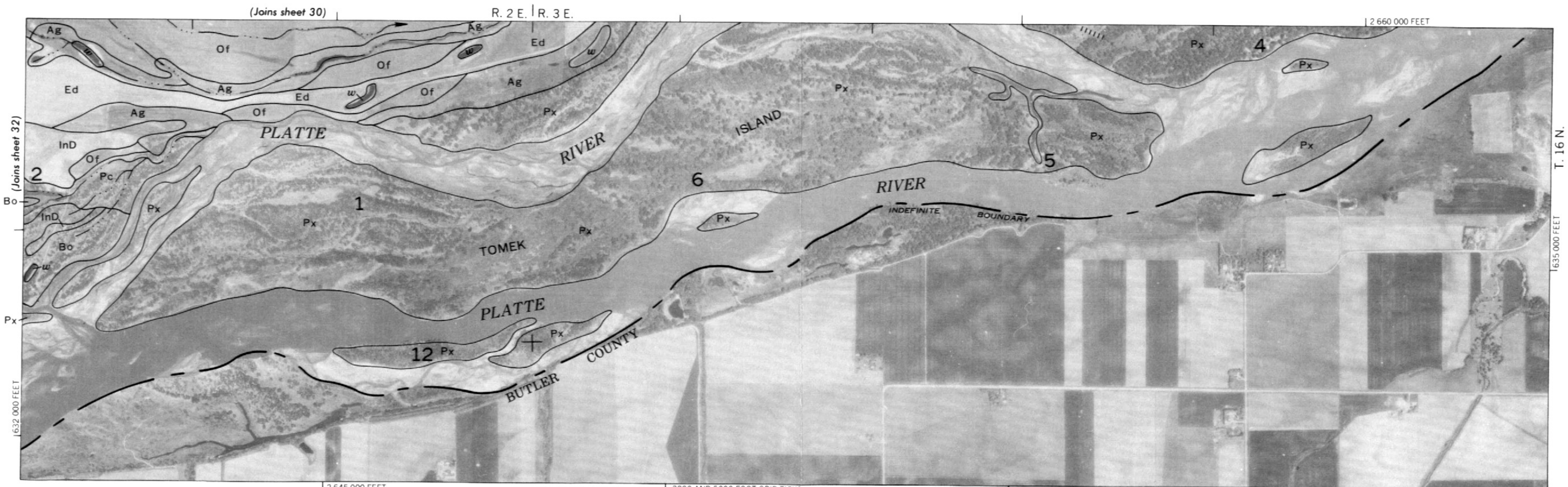

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